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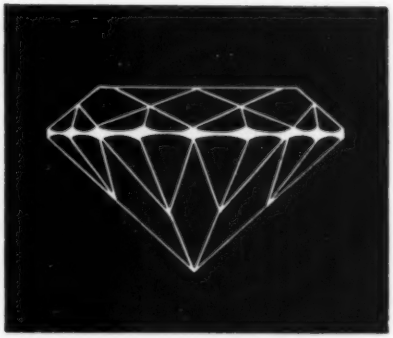

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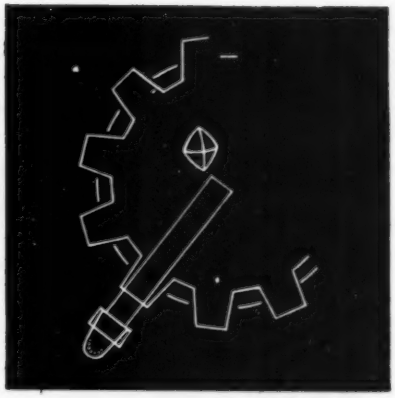

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Generally Speaking

Diamonds are for everything

There seems to be no end to the uses to which the versatile diamond can usefully be put. Not content with its historic position as a jewel, the diamond first of all became a cutting tool and a grinding abrasive; it was also used as a bearing, and later uses have been as a stylus in sound reproducers and in various instruments where a wear-resistant tracing point is required. It has entered the optical field as a lens and as a prism, and has been applied in nuclear physics as a radiation detector. Now a further use has been found in the world of physics, this time as a thermistor, for the detection of changes in temperature by the variation of its electrical characteristics as it grows warmer or colder. Here, as in many of its other applications, one of the most valuable features of the diamond is its chemical inertness, enabling it to be used safely in corrosive surroundings and even to be inserted into the human body without either losing its effectiveness or damaging its host.

Ancient and Modern

We referred some time ago* to repairs that were carried out on a U.S. landmark with the aid of diamond drills. A similar work, carried out in this country, was the repair of some of the uprights of Stonehenge. When this remarkable monument was being rehabilitated last year, it was discovered that there were cracks in the uprights in some cases that required reinforcing. For the same reasons as those influencing the choice of diamond drilling in the previous case, that is, the necessity to drill in hard material with a minimum of vibration that might increase the damage, the work was entrusted to a well-known firm of diamond tool manufacturers with a drilling affiliate company. The stones were successfully drilled and counterbored without any increase in the damage, and the reinforcing rods are now in position, keeping this centuries old monument together for, we hope, many more years.

ADAMANT

* IDR, Feb, 1959, p1-5.

Photomicrographs in Relief

by

A. R. Roy*

A description of modifications made to standard equipment in order to make it suitable for photographing diamond particles at 25 to 50 magnification. This is part of the same series of experiments as were described in IDR 1959, April, pp 66-67, 72-74; July, pp 126-127; Aug., pp 146-153 and Dec., pp 226-231 under various titles.

During recent investigations into the efficiencies of various diamond grits in resin-bonded grinding wheels, it became apparent that methods of photographing these grits, so as to give a reasonably accurate impression of their true shape was essential. The standard photographic technique using vertical lighting on to a transparent background gave a two-dimensional effect only, whereas a three-dimensional effect was what was really required. Oblique lighting on to a light coloured, matt finished background seemed to be the answer, as the third dimension (the height of the platelets) could then be represented by a shadow, the length of which would be indicative of the height of the diamond particle, which could be calculated to a fair degree of accuracy. With the conventional lighting set-up it was often difficult to tell from a photograph if any given particle was a platelet or a blocky form.

The optical system of a low-power microscope was of insufficient quality to allow of its being used, and ready-made equipment suitable for low-power photomicrography was not available in South Africa at the time. Suitable component parts were, however, available and it was decided that a satisfactory camera could be built.

Description of camera

The basis of the camera is a 4 x 5 in. 'Brand' view camera, purchased secondhand. This is a professional camera as distinct from one designed for amateur use. It has a revolving and tilting back, the slide holder sliding under the ground glass viewing screen which is held in place by spring clips. The camera also has a rising and falling front, which can also be moved sideways. The bellows is double thickness with a maximum extension of 17 in. or 43 centimetre.

As a direct magnification of 25X was required at the Laboratory, a Zeiss objective lens of 16 mm focal length and aperture f.2.5 was obtained. This lens is capable of giving a maximum magnification of 50X, and has a built-in iris diaphragm. The magnification is given, sufficiently accurately for all practical purposes, by the formula:

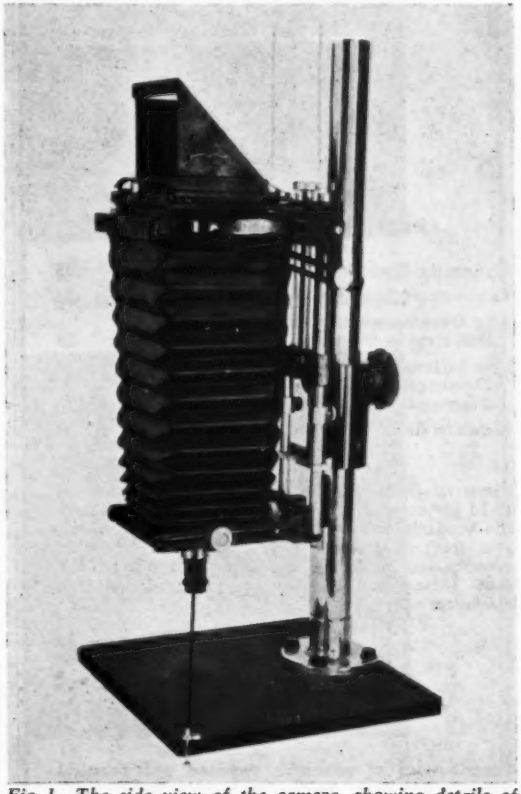


Fig 1. The side view of the camera, showing details of the method of attachment to the pillar, and the mounting of the focussing mirror.

$$M = \frac{D}{F}$$

where M = Magnification
D = Distance between lens and film
F = Focal length.

The magnification with 17 in. between lens and film is

$$\frac{17 \times 2.54}{1.6} = 27X$$

which was sufficient for the purposes required.

* Diamond Research Laboratory, Johannesburg.

The lens is mounted by means of a special adaptor in a standard camera shutter with bulb and time exposures. This adaptor has a long threaded section to allow for focussing, so that the maximum distance now obtainable between lens and film was 19¾ in. or 50 cm with a magnification of 31X.

The camera is mounted vertically in a heavy stand, the pillar of which is a piece of 2 in. tubing, ground parallel and chromium plated, flanged and bolted vertically to a steel base cloth plate 12 x 12 x ½ in. thick which is covered with green baize. Figures 1 and 2 illustrate the set-up and method of attaching the camera to the pillar.

In order to focus at eye-level, *ie* without looking directly down onto the ground glass focussing screen, a mirror was mounted at 45° to the focussing screen, enabling the user to focus easily. A faint double image is obtained owing to reflexion from the front surface of the glass mirror, but this is easily eliminated by viewing through a piece of polarizing filter which is suitably rotated.

In practice the distance between lens and film is set by means of the normal rack and pinion focussing arrangement of the camera to the distance necessary to give the required magnification, and the grit on the objective table brought sharply into focus by raising the table.

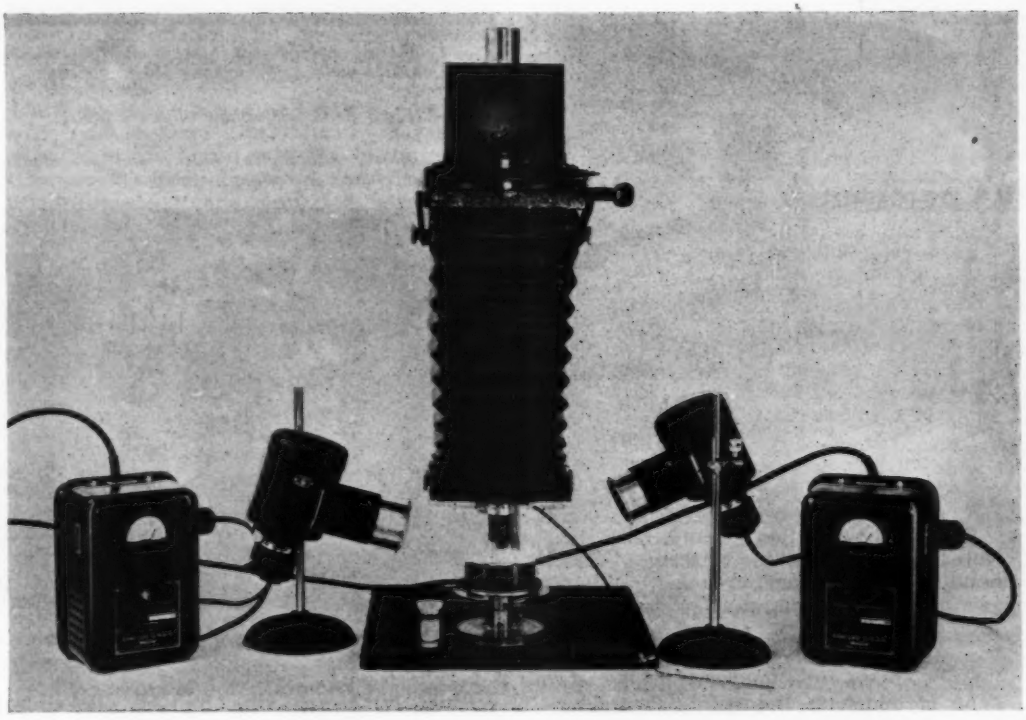


Fig 2. The camera and its associated apparatus set up for photography of grits at approximately 50×. The enlarged image can be seen in the focussing mirror. One of the two lamps is at full brightness, and the other at a much lower level, to give the relief effect.

In order to eliminate the need for constantly moving the camera up and down on the pillar, an objective table capable of being raised or lowered was made (Fig 3). This utilizes the principle of the screw jack, and can actually be used for focussing more conveniently than by using the screwed holder of the lens.

Two spotlights are used, one at full brightness and the other, diametrically opposite, of sufficient brightness to illuminate the top of the grit without casting a second shadow. With the use of a single spotlight one is apt to lose detail on the surface of the grit particles, particularly black particles.

The best background for the grits has been found to be the emulsion side of an unexposed photographic plate. This, however, darkens fairly rapidly on exposure to light, and needs to be replaced frequently. However, if an unexposed photographic plate is immersed in a weak solution of potassium iodide, and then washed and dried, the less sensitive silver iodide so formed can be used for far longer periods without replacement.

Figures 4 and 5 show a mixture of blocky diamond particles taken in relief, and with conventional flat lighting.

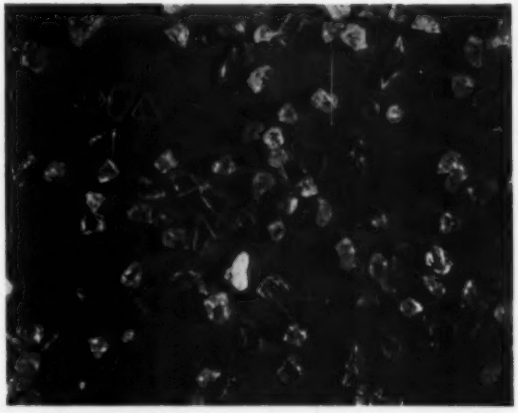
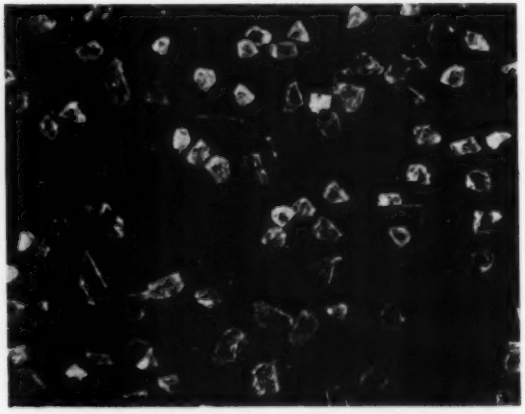


Fig 4 (above). Mixture of blocky and flat diamond particles under relief lighting (50 × approx).

Fig 3 (left). Adjustable objective table.

Fig 5 (below). Mixture of blocky and flat diamond particles under conventional lighting (50 × approx).



The Birmingham Industrial Diamond Exhibition

The exhibition of the industrial applications of diamonds at the Birmingham Museum of Science and Industry, mentioned in previous issues of the *Industrial Diamond Review* was opened on Tuesday, February 16th, and will close on Wednesday, March 16th.

On Wednesday, March 2nd at 6 p.m., there will be a talk by the Editor of the IDR on the History and Uses of Industrial Diamonds, and on Wednesday, March 9th, Dr T. F. Gaskell will lecture on "Drilling to the MOHO".

Films dealing with Industrial Diamonds will be shown on the Thursdays and Fridays following these lecture dates.

Anyone proposing to take an organized party to the Exhibition is requested to inform the Keeper of the Museum, Mr. N. W. Bertenshaw in advance, so that arrangements can be made for full manning of the demonstration machines. The address is Newhall Street, Birmingham 3, and the telephone number Central 1022.

The Development of the Diamond Industry in Yakutia

by M. Corper

Based on material from official source, derived from a discussion on some problems and prospects of the industry by G. Granik and G. Naumov in ' Planned Economy.'

The Yakut autonomous republic is to become one of the world's greatest diamond mining centres under the 7-Year Plan for the economic development of the USSR. This task, of major economic importance, follows the increased industrial use of diamonds in the technical progress of the various industries.

Until recently, the USSR'S own diamond mining industry was insufficiently developed, output from the Urals satisfying but a part of the Soviet industrial demand. Great efforts were therefore made to prospect for more home deposits.

In 1940, the diamond-bearing nature of the Siberian plateau between the Rivers Lena and Yenisei was proven theoretically. Its geological history is strikingly similar to that of the South African plateau containing most of South Africa's deposits.

In 1949, this forecast was proven when alluvial diamond deposits were found in the middle reaches of the River Vilui and proved to be much richer than those in the Urals. By the end of 1954, hundreds of such deposits had been found in the Vilui basin, but the search was continued as they could not fully meet the demand.

The first major deposit—the Zarnitsa kimberlite pipe—was found at the end of 1954 in the upper reaches of the River Markhi. Although low in diamond content, it served to improve prospecting technique.

In 1955 about a dozen kimberlite pipes were found, including the Mir and Udachnaya pipes, now representing the main Yakut deposits. As a result of detailed exploration, the commercial content and reserves of diamonds in two areas of the Vilui basin were established: the Mirnitzky (or Irelekh-Botubuy) area in the south, in the basin of the River Malaya Botubuy, a Vilui tributary; and the Daldyn area in the upper reaches of the River Markhi, on its tributary, the Daldyn.

More deposits have been found—of lower diamond content—which represent long term reserves, so the search for rich deposits continues.

To facilitate the task set by the 21st C.P.S.U. Congress of laying the groundwork for creating a diamond mining industry in Yakutia, the Yakutalmaz Trust was founded in 1957, which that year started the commercial mining of diamonds at the Mir pipe. The diamond production programme for the whole of 1957 was fulfilled during the first six months. In 1958, a quarry and two small dressing plants began operating.

The 21st G.P.S.U. Congress's target figures envisage a 16-fold increase in the USSR's diamond output in 1965, as against 1958, which will largely cover the country's demand for industrial diamonds.

The sequence of construction of diamond industry plants, their capacity and the technological flowsheets of diamond extraction and separation were established on the basis of a preliminary analysis of a number of technological and economic variants. As a result, the Yakut economic council, jointly with several scientific institutions worked out the blueprints for two large diamond mining centres: one around the Mir pipe and the River Irelekh deposits, the other around the Udachnaya pipe; both to be brought into production in 1970. A motor road is being built, linking the Mir pipe and the district centre of Mikhtuya, 161 miles south.

So far, a quarry to work diamond bearing placers, a kimberlite mine, crushing plants and two diamond separation plants have been built at the Mir pipe, along with a power station, a river dam, dwellings, schools, etc. The diamond town of Mirny is now 10,000 strong.

By 1965, the Mirny area will have a dressing plant with a daily capacity of hundreds of tons of blue ground. By then, mining operations at the Mir pipe will be increased about 70 times over, as compared to 1958. To accomplish this, the most modern equipment will be needed (power shovels with 140 and 270 cu ft scoops, diamond drilling rigs, trucks, etc). Huge electric dredges will be used to work the diamond placers.

On the town's outskirts, factories will be built for concrete, lime, gypsum and brick, etc, and forest ranges set up along the Mukhtuya-Mirny motor road to supply timber.

By 1965, Mirny's population will have doubled; perhaps trebled.

The Udachnaya pipe lies about 280 to 310 miles north of the Mir pipe. By 1970, a range of diamond mining plants similar to the Mir project is expected to go up in the area.

One of the most acute problems in developing the Yakut diamond mining industry is: power. To solve this problem, it was originally planned to build a thermal power station in the Vilui basin (Nyurba area) on the basis of the large brown coal reserves of the Kirov deposit, 217 miles from the Mir pipe, 310 miles from the Udachnaya. In favour of the plan were the easy coal mining conditions, and the deposit's situation in the centre of the Vilui basin's most populated agricultural areas. Against it is the distance between the power station and the industrial centres it must supply, causing rather big losses in transmission.

Other suggestions included laying a gas pipeline from the Ust-Vilui gasfields to the Mirny area, and a gas-fired station built there; building thermal stations at Mukhtuya, on the River Lena, or in Mirny, and fed from the Mamakan hydro-power station, Irkutsk region; finally, building a power dam on the Upper Vilui.

In 1958 it was finally decided to build the dam, its first section to be completed in 1964.

Another problem is, supplying miners and workers with farm products, especially fresh meat, milk, vegetables. Three state farms were established in 1957 to supply Mirny and Daldyn. Delivery is by plane in summer, by lorry in winter. Cattle are driven to Mirny and slaughtered there.

The collective farms of the Lena, Olekma, Suntara and Nyurba districts will also supply the new centres.

To make the resources of the Far North—especially the diamond bearing areas of Western Yakutia—available to the national economy, transport facilities must be extended to build the communication lines needed.

Western Yakutia's areas with the most promising diamond deposits are very remote, both from the country's main economic centres and from the main industrial centres of Yakutia itself.

Their development is hampered by the scarcity of human habitations and the difficult access to the areas through lack of roads. Establishing communication lines within and between districts is therefore most important.

Supplies to the diamond bearing and other areas of Yakutia will come from Siberia, the Urals, and the country's central districts. According to economic estimates, it will be expedient to deliver supplies to the Daldyn-Alakit diamond bearing area by rail, water and road. Planes will also assist in the goods turnover of the Yakutia diamond mining centres.

The solution of these problems of the exploration of the diamond deposits of Yakutia will enable the USSR to develop an industry that will meet the growing demand for industrial diamonds—which, in turn, will stimulate technical progress in all branches of the national economy.

The Influence of the Crystallographic Orientation on the Wear of Truing Diamonds (*G. Pahlitzsch, pp 31-37*)

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6) F. Karpinski. Experiments conducted with diamond truing tools for use with grinding wheels. Versuche mit Ebdrehdiamanten fuer Schleifscheiben. *Maschinenbau* 1930 Vol 9 p 512.

Notes

(a) The diamond pyramids were prepared specially for this purpose through the kind cooperation of the late Dr. Ing. P. Grodzinski of the Industrial Diamond Information Bureau, London, Industrial Distributors (Sales) Ltd and were placed at my disposal for these experiments. One series of three diamond pyramids was produced in the London laboratories of this firm, three further specimens came from the Diamond Research Laboratory, Johannesburg, under the direction of Dr. J. Custers. Greatest thanks are extended to the above-mentioned for their kind help.

(b) Dr. Ing W. Thoeing and Dipl Ing K. H. Wickop were responsible for carrying out the experiments.

The Influence of the Crystallographic Orientation on the Wear of Truing Diamonds

by

G. Pahlitzsch*

In spite of the diamond's extraordinary hardness it is a recognised fact, that, like all other tools it is subject to wear, although the degree of wear is small in comparison with other tools, it is not insignificant. Diamond tools for the truing of grinding wheels are among those for which especially high claims are made, and for this reason the experiments carried out at the Institute to which the writer belongs, were limited to this kind of diamond. The aim of the experiments was to determine how far the susceptability to wear of these diamond truing tools is influenced by their crystallographic orientation. It is already well-known that the diamond's resistance to wear is one of its anisotropic properties and it should not be necessary to go any further into the crystal structure of the diamond here. If information on this point is needed, the relevant literature should be consulted [1,2,3,4]. Not all of the diamonds found naturally are regular in their crystal formation, but of those that are, the octahedron is the most common shape. In irregularly shaped diamonds, there are normally faces which correspond to one of the three significant planes (cube, octahedron, rhombic dodecahedron). These planes, or their vertical axes are referred to by crystallographers according to Miller's indices, and the following numerical references are used

for cube faces (100)
for octahedron faces (111)
for rhombic dodecahedron faces (110).

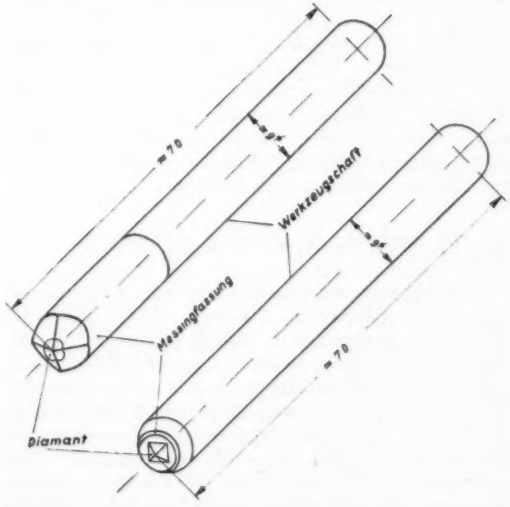
Symbols referring to these axes are put in square brackets, thus

[100] normal to the cube face (100)
[111] normal to the octahedron face (111)
[110] normal to the rhombic dodecahedron face (110)

Diamond cutters, however, do not use the Miller system; they make use of a different series of symbols, derived from the number of corners visible on looking at an octahedron along the line of a crystal axis and which are symmetrical to such an axis. According to this system, a cube face, for instance (100)—seen diagonally—is called a four-point-face (4 P), and octahedron face (111)—looking vertically on to the face—is a three-point-face (3 P), and a rhombic dodecahedron (110)—looking vertically towards one edge—is a two-point-face (2 P). The diamonds used in the tests were referred to according to the latter system.

(2) *The diamonds used in the experiments*

These were cut as in Figs 1 to 3 in the shape of a quadrangular pyramid with a square base and the angle between the sides at the top measuring $\varepsilon = 130°$. They were then held in a brass holder, fitted into a cylindrical steel mount[5]. Thus in the case of a 4 P diamond, which during truing is held parallel to an imaginary cube face, the crystallographic axis [100] runs in the direction of the tool mount. In the same way, the axis [111] of a 3 P diamond and the axis [110] of a 2 P diamond lie in the direction of the tool mount.



Figs 1 and 2. Diamond truing tools used in the experiments for truing grinding wheels. (1) Type produced by the Diamond Research Laboratory, Johannesburg. (2) Type produced by the Industrial Diamond Information Bureau, London.

* Prof. Dr.Ing. G. Pahlitzsch of the Technische Hochschule, Brunswick.

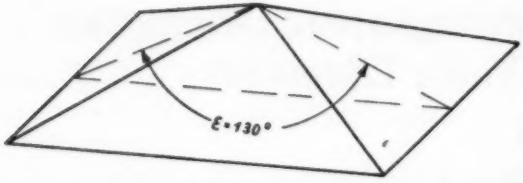


Fig 3. Proportions of the angles in the diamond pyramids.

In speaking of the tools used in the experiments it should also be mentioned that in the tool in Fig 1 (designed in Johannesburg) the grinding of the pyramid shape took place after the mounting of the diamond, so that the sides of the diamond pyramid lie in the faces of the brass pyramid of the tool mount. In the tools as shown in Fig 2 (designed in London), however, the diamond was ground before being mounted. According to Dr. Grodzinski, the variations in angle which cannot be avoided completely in the production of crystallographically aligned diamond tools, amounted to 10 to 12° in the case of the tools shown in Fig 1 and only 1.5 to 2° in the case of those shown in Fig 2. Three specimens of each kind of tool were available. As different diamonds can have different degrees of hardness, however, special care was exercised in choosing the diamonds for each set of tools. The tools shown in Fig 1 (Johannesburg) were fitted with diamonds of good industrial quality, those shown in Fig 2 (London) with diamonds of gemstone quality. In addition a rough diamond, with its crystallographic axis [100] lying in the direction of the tool mount, was also included in the tests, in order to determine the influence of a ' coated surface.' Altogether the diamonds used in the tests weighed 1 carat.

(3) *The machine and grinding wheels used in the tests*

The machine used in the tests was a cylindrical grinding machine of the type FGH 200/750, produced by Maschinen- und Schleifmittel Werke AG of Offenbach/Main. The grinding wheel spindle was driven by a 3 KW shunt wound DC electric motor (with field regulator control) so that the speed could be finely adjusted within the range of 1400 to 2800 rev/minute. The horizontal movement of the table was hydraulically operated and allowed an infinitely variable adjustment of the table speed within a range of 0 to 20 ft/minute. The feed, which was operated automatically at the end of each cycle and could be adjusted between 5 and 30 micron in stages of 5 micron. The grinding wheel used had an initial diameter of 17.5 in. and a thickness of 2 inches. They were of the type 46L8V60 ke, produced by the MSO-Werke of Offenbach. A finer-grit grinding wheel of the type 220 Jot was only fitted for the tests made to determine the influence of coated surface in the case of an unpolished diamond. Before the tests were begun all the grinding wheels were carefully balanced in order to avoid any damage to the diamond through oscillation.

(4) *Experimental conditions*

In the most important tests the following figures remained constant:

Cutting speed	approximately 82.5 sfs
Cross feed	approximately 3 ft/min.
Feed	5 micron m/cycle.

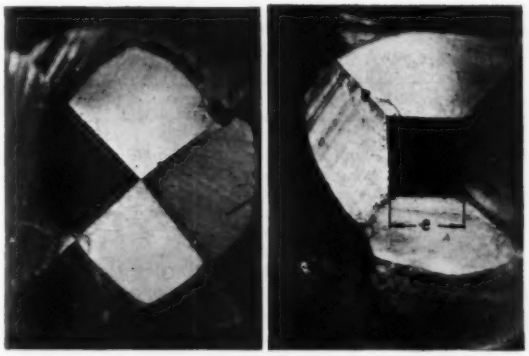
These tests were, however, preceded by others in which the above were altered in order to determine the influence of workshop conditions on diamond wear. In connexion with these tests, it need only be mentioned here that wear on the diamonds increases in proportion to both cutting speed and thrust. As long as a rate of about 3 ft/min. is not exceeded, the feed speed during the truing process is of less importance. Greater table speeds, however, also cause a considerable increase in wear on the diamond. In order to eliminate as far as possible the influence of possible differences in the hardness of texture of the grinding wheels being ' machined,' the three test tools of each kind were brought into use in turn. In each individual test about 6 cu in. of grinding wheel was ground away, while for a complete series of tests the figure was from 135 to 180 cu in. It was decided for the following reasons that the angle of inclination of the diamond holder should be $\lambda = 0s$. In order to eliminate the influence of specially favoured directions of grinding inside the face, the diamond pyramid was kept so that one side always pointed upwards and was turned in an angle of 90° after each individual test, so that each side in turn occupied the same position.

In all the tests an emulsion of Shell Dromus Oil B, concentration 1 : 50 was used for cooling. The flow of coolant amounted to 10 gal/minute. Thus efficient cooling was ensured.

(5) *Measuring methods*

It was decided not to measure the amount of wear on the diamond, to enable the latter to be measured accurately. For this reason the possibility of ascertaining the amount of wear by measuring the volume was considered. In the experiment a

wear surface develops on the diamond matching the working surface of the grinding wheel. This is a surface of cylindrical section with a radius of 5 to 7 inches. Since the wear surface is at the most 0.04 to 0.05 in. wide (e) the curved cylindrical surface can be ignored and the plane tangential to it taken in its place. Thus the diamond takes on the shape of a truncated pyramid whose volume can be determined by measuring all the edges. Since the diamond was adjusted with the shaft radial to the grinding wheel (as described above) the resulting wear face is perpendicular to the four-sided pyramid, forming a square with side e (see Fig 4). This side can easily be measured under the workshop microscope. The diamond was studied from two angles, once along the shaft, that is in a line perpendicular to the wear surface, and once from an angle of 25° to it, that is in a line perpendicular to one of the sides of the pyramid.



Figs 4a and b. Truing diamond pyramids (110); (2P). (a) before the truing experiments. (b) after the truing experiments. e = length of the wear surface; enlarged approx 10 times.

Thus each edge of the wear face was measured twice, and each measurement was entirely independent of the other. The measuring accuracy of the workshop microscope was about 5 micron. Each of the four sides of the square was measured in turn and the arithmetrical mean value calculated. If the angle of the top of the pyramid between the sides is ε and the side e, the volume of the wear on the diamond will be

$$V_D = 1/6\ e^3 \cdot \cot \varepsilon/2$$

and since $\varepsilon = 130°$

$$V_D = 0.078 \cdot e^3.$$

With the unpolished diamond, this method could not be used as the surfaces of the diamond to be examined were moved and irregular. Volume was again the means by which the amount of wear was determined, but the experiment had as a mathematical basis, Fig 5 and the following equation:

$V_D = \int F(h) \cdot dh$; or for an integrated Δh:

$V_D = \Sigma F(h) \cdot \Delta h$.

F = area of wear surface; Δh = decrease in length for each experiment.

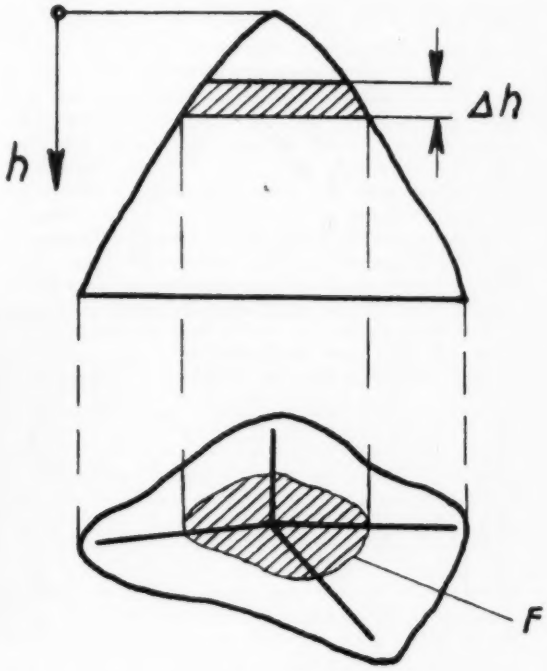


Fig 5. Diagrammatic sketch to determine the volume of wear on rough diamonds.

If the decrease in the length of the diamond in each individual experiment amounts to only a few microns, the integral can be replaced by a plus sign so that only the area of the wear surface and the reduction in the length of the diamond have to be discovered in each experiment. After each experiment, therefore, a photomicrograph of the diamond was made. By means of a microfilm projector, this was then projected onto a screen with a linear enlargement of 200 times and transferred to paper. The area of the resulting surface could be measured with a planimeter and after being divided by the square of the linear enlargement gave the area of the wear surface concerned. For measuring the decrease in length in each experiment, a special equipment for measuring length was

designed and by using this in conjunction with an optimeter a measuring accuracy of about ± 1 micron was achieved. To determine the volume of the grinding wheel wear, the diamond of the grinding wheel was measured before and after each experiment with the aid of a micrometer gauge (degree of accuracy approximately 0.02 mm).

(6) *Results of the experiments*[b]

61. *Diamond wear depending upon the volume of grinding wheel worn away*

Fig 6 illustrates the corresponding curves for the three diamonds of different orientation. Here it is the diamonds from the London laboratory, which are being considered. It is recognized that by and large, the increase in volume of the wear is proportional to the volume of grinding wheel worn away. In this experiment the 2 P-diamonds (110) showed the most, and the 3P-diamonds (111) the least wear. The weak 'S' shape is true of both kinds of diamond.

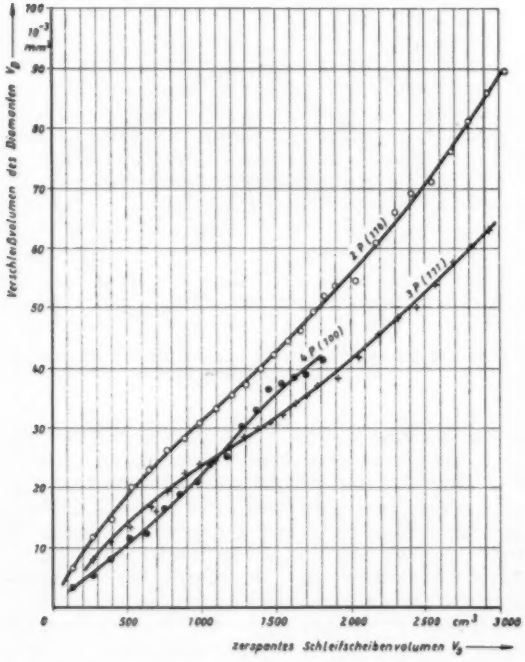


Fig 6. Volume of wear on diamonds of different crystallographic orientation in relation to the volume of grinding wheel machined away. Conditions under which the experiments were conducted: Grinding wheel: 46 L 8 V 60; d = 450 to 250 mm; b = 50 mm; v = 23,4 m/s; v_T = 1,0 m/min; a = 5 micron/EH; λ = 0°. Diamond pyramids of gemstone quality from the Industrial Diamond Information Bureau, London.

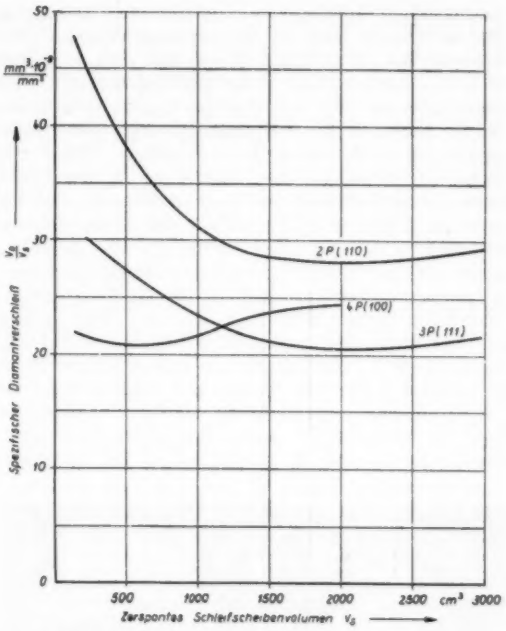


Fig 7. Specific diamond wear on diamonds of different crystallographic orientation in relation to the volume of grinding wheel machined away. Conditions under which experiments were conducted: as in Fig 6.

The reason for the somewhat sharper rise of the curve at the beginning can be found in the application of the feed force to a relatively small area of diamond, while the later sharpness of the curve might be the result of an increase in heat caused by friction on the contact surfaces of the diamond and the grinding wheel, which had in the meantime increased in size and of the resulting increase in heat stress. The accuracy of this explanation is, however, open to doubt, as the curve of the 4P-diamond (100) shows a falling off. In spite of the care with which the diamonds were chosen, the possibility of uneven quality must be taken into account, as indeed is the case with all natural products. The declining curve of the 4P-diamond might, however be accounted for by the fact that the tip of the diamond was cut away as soon as it was applied to the grinding wheel. Thus there was a larger contact surface from the very beginning. The difference in the volume of wear between the 2P and 3P diamonds is, however, so great, that the influence of orientation must there be recognized. At first the 4P curve is lower than that of the 3P-diamond; later, however, it is quite clearly above it. Thus, disregarding initial wear the diamonds could be

placed in ascending order of volume wear, 3P, 4P, 2P. It is also advisable to consider the specific diamond wear shown in Fig 7, that is the volume of wear on the diamond in relation, is the volume of grinding wheel cut away (V_D/V_S). If the wear phenomena observed during the grinding of the first 90 cub in. of the grinding wheel are disregarded, this will clearly support the grinding wheel order given above. If the three differently orientated diamonds are compared in a range where the specific wear has a more or less constant value, say after about 1500 cub cm of grinding wheel has been machined away, the specific wear values will be as follows:

2P : 4P : 3P = 1,33 : 1,15 : 1

or the wear resistance

2P : 4P : 3P = 1; 1,15 : 1,33.

In order to obtain the maximum tool life from a truing diamond, it should be gripped so that the crystallographic axis lies in a line with the tool shaft or so that while truing is in progress wear takes place on the diamond parallel to an octahedral plane. If the life of a diamond is taken to be proportional to its wear resistance, the life of the 3P orientated diamond would be approximately 33% longer than that of a 2P orientated diamond, for instance. The behaviour of a 4P diamond, lies somewhere between the two. Comparing this result with those gained from practical experience of diamond grinding, as can be seen in Fig 8, a quite unmistakable degree of conformity is to be found. The easiest to grind are the rhombic dodecahedral faces (r), and these are followed by the cube faces (k), while the octahedral faces (o) present the greatest resistance to grinding. On a given face the grinding direction also exerts a strong influence. The arrows marked on the diagram show the most favourable direction for grinding, while the length of the arrows gives a rough indication of the amount of ease with which grinding can be carried out. Consequently there is one favourable grinding direction on the rhombic dodecahedral face. This is in fact one of the cube axes projected onto the former. On the cube face there are 2 cubic axes, while on the octahedral face there are three favourable grinding directions, which in fact consist of the orthogonal projections of the axes on the 3 cube faces[2,5].

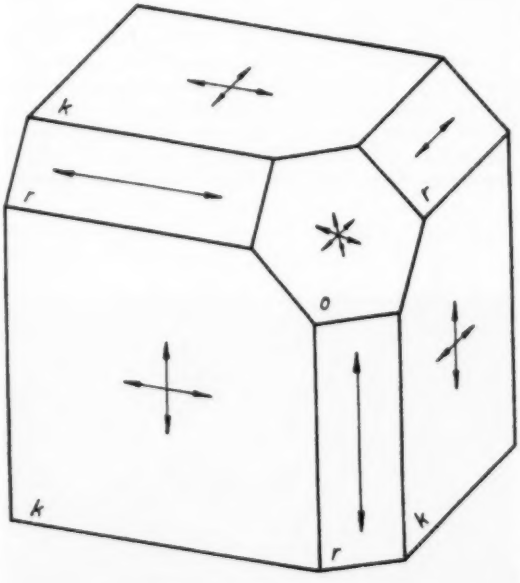


Fig 8. Grindability of orientated crystal faces [5]. The arrows show the most favourable directions for machining. The length of the arrows gives a rough indication of the ease with which machining can be carried out.

Grodzinski also reports on experiments made on the grindability of diamonds. In these experiments the diamond was used as a workpiece, that is the passive agent. Corresponding experiments made by Tolkowsky (1920) and Grodzinski and Stern (1944), however, also show that the octahedral face (111); 3P) offer the greatest resistance to wear. Beyond this point, however, they do not come to full agreement. Whereas Krauss and Slawson found the order to be 3P - 2P - 4P, Tolkowsky and Stott declared it to be 3P - 4P - 2P, that is the same result as that obtained in the present truing experiments. These results are also confirmed by theories enumerated by Schultnik, Spier and Van der Wagt, who supported their theories with experiments in which a diamond heated in an oven in a hydrogen atmosphere to a temperature of 800° to 900° C was subjected to a concentrated and accurately directed jet of oxygen. The time taken to penetrate to the same depth was longest on the octahedral face (111); 3P) and shortest on the rhombic dodecahedral face (110); 2P). In spite of the fact that the present experiment agreed with those of Tolkowsky and Stott, Schultink, Spier and van der Wagt, in a corresponding comparison of the Johannesburg diamonds (Fig 1) we arrived at the order suggested by Krauss and Slawson, in which the cube face (100); 4P) showed the least wear resistance. Fig 9 shows this result by means of specific diamond wear. There is no conclusive explan-

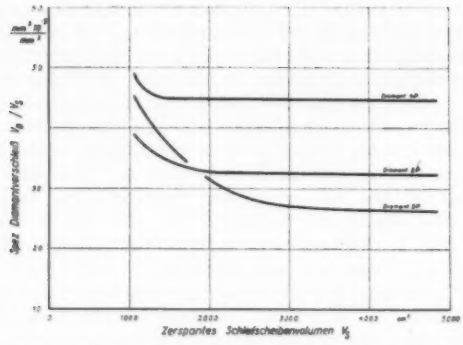


Fig 9. Specific diamond wear on diamonds of different crystallographic orientation in relation to volume of grinding wheel machined away. Conditions under which experiments were conducted as in Fig 6. Diamond pyramids of industrial quality from the Diamond Research Laboratory, Johannesburg.

ation for the initial intersection of the 2P and 3P curves, but this could be the result of wear on the diamond point which is evidently dependent on certain circumstances. Furthermore the wear figures themselves are also higher than those shown in Fig 7, referring to the diamonds from the London laboratory, for which it may be inferred that quite considerable differences may be forthcoming. In connexion with this it should be remembered that the London stones were of gemstone quality, whereas the Johannesburg diamonds were merely good quality industrial stones. The possible extent to which the results referring to the order given above, may be influenced by differences in the quality of the orientated stones, cannot be deduced from the experiments. The behaviour of the diamond, according to Winkler's calculations depends on the number of bands in the crystal lattice involved, according to which faces ((111), (110) or (100)) are being considered, and are as follows:

$$(100) : (110) : (111) = 1 : \sqrt{2} : \sqrt{3}.$$

This would then also give the theoretical order of hardness. According to Fig 9 the specific diamond wear is as follows:

3P diamonds (111) $V_D/V_S = 26 \cdot 10^{-9}$
2P diamonds (110) $V_D/V_S = 32 \cdot 10^{-9}$
4P diamonds (100) $V_D/V_S = 45 \cdot 10^{-9}$

Since the degree of hardness is in inverse proportion to the degree of wear the following can be stated:

$$(100) : (110) : (111) = 1/45 : 1/32 : 1/26$$
$$\approx 1 : 1.41 : 1{,}73 \approx 1 : \sqrt{2} : \sqrt{3}.$$

This agreement with Winkler's theory is only good, however, as far as the Johannesburg diamonds are concerned. In the case of the London diamonds, which are of gemstone quality the positions of the 2P and 4P diamonds are reversed and the hardnesses are as follows:

$$(110) : (100) : (111) = 1 : 1.15 : 1.33.$$

The results of the present experiments are therefore unfortunately not completely satisfactory. In order to obtain more conclusive results it would be necessary to make use of statistics derived from a great number of experiments, for however carefully the selection of the diamond to be used in the experiments may be carried out, it will always remain open to question. With regard to the octahedron face (111), the results reached here—which are supported by other authorities—can be considered to be conclusive: this face is shown to offer the greatest resistance to wear and is therefore the least subject to abrasion.

62. *The influence of the coating of the diamond*

A deep-mined diamond with the crystallographic [100] axis lying in line with the tool mount was also included in the experiments. The aim of this experiment was to discover whether the coated surface of a diamond offers greater resistance to wear than the core. This should be shown by a jump in the wear curve after the grinding through of this natural surface. As can be seen in Fig 10, such a jump was in fact established. The high degree of wear after the first 5 cub in. had been ground away must be ascribed to the sensitivity of the diamond point, while the low increase in wear after a further 6 cub in. of grinding wheel had been machined away must be the result of the greater

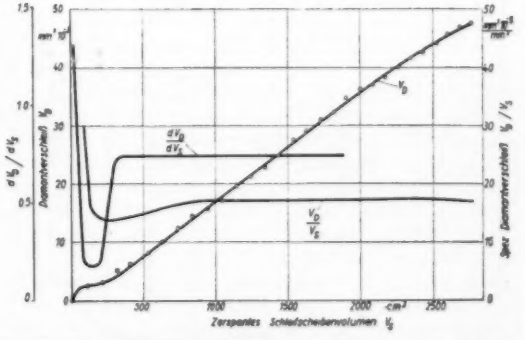


Fig 10. Diamond wear and differential curve of diamond wear in relation to the volume of grinding wheel machined away, for an orientated rough diamond. [110] axis in a line with the tool mount. Conditions under which experiments were conducted: Grinding wheel: 220 Jot; d = 450 to 250 mm; b = 50 mm; v = 24,8 m/s; v = 1,0 m/min; a = 10 micron/EH; λ = 0°.

Fig 11. Rough diamond before truing experiments began, Enlarged approx 10 times.

hardness of the coated surface. The difference in hardness is clarified if the differential curve $dV_D/dV_S = \sqrt{(V_S)}$ is also taken into consideration. On the side faces the coated surface continues to have effect, but as the wear surface increases in size, its relative influence becomes increasingly smaller. A comparison of the ordinate values of the differential curve show the proportion of hardness between the natural surface and the core to be approximately 4: 1. Figs 11 and 12 show the truing diamond before the beginning of the experiments, and after the grinding of about 2750 cub cm of grinding wheel. From the position of the minimum value on the differential curve in Fig 10 and the corresponding decrease in the length of the diamond, the thickness of the natural surface can be fixed at between 30 and 50 micron. As the thin coated surface of a truing diamond is quickly penetrated, however, no final conclusions can be drawn from this isolated experiment, and as a result no practical importance can be ascribed to this assertion which is made with the greatest reservation.

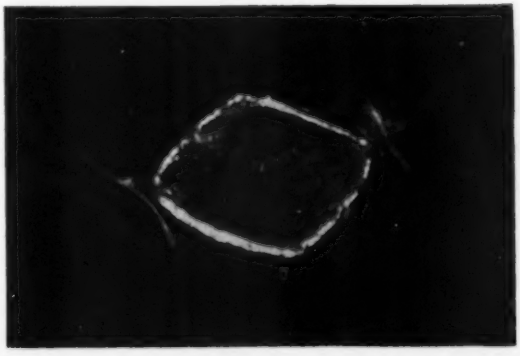


Fig 12. Wear surface of the rough diamond after the truing experiments. Enlarged approx 10 times.

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(7) *Conclusion*

Wear experiments carried out on crystallographically orientated truing diamonds ground in the shape of an equilateral pyramid have been confirmed by results obtained in different ways by other research workers, even in so far as they contradict each other. With two groups of crystallographically orientated diamond tools, one of gemstone quality, the other of industrial quality, it was found that the octahedron face showed the most resistance to wear. Therefore truing diamonds should be crystallographically orientated in the holder, so that the line of the tool mount forms a normal to the octahedron face. In this way the life of a truing diamond can be considerably increased. With regard to the cube face (100); 4P), and the rhombic dodecahedron face (110); 2P) it was found that the rhombic dodecahedron face was softer than the cube face in the group of diamonds of gemstone quality, while with the industrial stones the positions were reversed. Both of these orders of hardness were also confirmed by other research workers.

In experiments conducted with a rough diamond, it appeared probable that the natural surface is harder or has greater resistance to wear than the core of the diamond crystal. Since the thickness of the natural surface amounts only to 30 to 50 micron, however, it is quickly penetrated.

It is, however, noteworthy that the specific diamond wear (Fig 10) is lower in rough diamond than in the ground diamond of the same orientation, namely (100); 4P) and this is equally true for both the London diamond of gemstone quality and the Johannesburg diamond of industrial quality. Indeed the amount of wear recorded is considerably below that of the 3P diamonds orientated according to their [111] axes, which were shown to have the most resistance to wear. It must therefore be assumed that the natural surface does exercise a very considerable influence. Doubts must be raised, however, in so far as the quality of the rough diamond was not more closely defined.

News in Brief

The Siberian scientific research centre in Novosibirsk is examining plans for drilling the Earth's crust to depths of up to 12½ miles in order to get reliable information about the composition of the rocks which form the deep lying strata and obtain access to the places where deposits of minerals are formed, and also to use sub-terranean heat for power generation.

Various proposals for sites for deep drilling are now under consideration. Academician Vladimir Sobolev suggests it should be done in the area of Yakutia's kimberlite diamond pipes, while others suggest Kamchatka or the Aldan basin.

The Colombian Minister of Mines stated recently that negotiations would start shortly with a view to organizing the Empresa Colombiana de Esmeralda, in which private Colombian and foreign capitals could take part. He added that Colombia still produces the finest emeralds in the world and that the country's production represents nearly 95% of world output.

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Angola's diamond production during the first 9 months of 1959 totalled 772,740 carats, as compared to 748,170 carats during the corresponding period of 1958.

British Guiana produced 51,090 stones weighing 9,367 metric carats last December, as against 62,392 stones weighing 9,935 metric carats in November. For the whole of 1959, production totalled 430,466 stones weighing 62,328 metric carats, as compared to 280,047 stones weighing 33,091 metric carats during the same period in 1958.

According to reports from Sierra Leone, diamond purchases last year amounted to approximately £5,700,000, or an £1,600,000 increase as compared to 1958. Much of this official buying was done through the Kenema Government Diamond Office, which, since it opened in August 1959, purchased over £2,600,000 worth of stones.

In December 1959 the Government Diamond Office bought 62,420 carats worth £590,597, which was regarded as a record and was three times more in value than was officially bought in December of the previous year.

Diamond deposited with the Government of Ghana during last December totalled 148,529 carats, as against 182,637, carats received at the Diamond Market in December 1958.

Venezuela's output of diamonds during the period January-November 1959 totalled 88,998 carats. This represents an increase of 9,319 carats as compared to the same period in 1958.

West Australian Premier Brand announced a Broken Hill Pty Ltd plan to develop their on ore deposits on Koolan Island in Yampi Sound at a capital cost of £6,300,000. He stated this after B.H.P. representatives had carried out extensive geological examinations and diamond drilling.

South-West Africa's diamond production during November 1959 amounted to 79,133 carats; 4,079 carats of industrial diamonds worth £8,957 were sold; and 34,392 carats of gemstones valued at £550,068 were exported.

Diamond as Thermistors

A rare blue diamond, mined in South Africa, may in future play an important part in space flight and in medicine. It is found in various mines in the Union, and recently scientists at the Diamond Research Institute in Johannesburg developed a way of attaching electrical leads to it, as a result of which it can now be used for recording minute temperature changes as small as 1/500th of a degree. In other words: it becomes the sensing element of a thermometer.

Such elements are called thermistors—and (although there is great competition from other elements in this field) diamonds resist the effects of acid and high temperatures much more successfully than most. Research on this property of the diamond started 8 years ago when it was discovered in Johannesburg that some stones conducted electricity. As a result of work done in the laboratory in Johannesburg, these blue stones may one day find a place in space ships where they may be used to record minor changes in temperature and to detect radiation. In medicine they would give almost instantaneous temperature readings.

New Equipment for the Adamant Laboratory

A unique machine which can change the colour and physical properties of diamonds by means of hard x-rays and Gamma rays was set in motion at the Diamond Research Laboratory in Johannesburg on Friday by Mr. H. F. Oppenheimer, chairman of De Beers. The machine, called a cascade generator, is the only one in the world capable of delivering an electron beam of three milliamps at a tension of 1.4 million volts, and was built by the Philips organization.

Mr. Oppenheimer said the dose rate of Gamma radiation was 250 Rontgen per minute at a distance of one metre from the target. Equipment would be used for irradiation of diamonds by both electrons and Gammas. By using electrons the laboratory hoped to change the surface structure of diamond crystals. The generator would run continuously as continuous operation was necessary for the production of colour effects in diamonds.

Mr. Oppenheimer added that the use of the machine might result in the discovery of diamond properties which were now unknown.

News in brief (cont.)

A Bill to encourage increased diamond production in the Union of South Africa was read a second time in the House of Assembly in Cape Town on Monday.

Minister of Mines, Senator J. de Klerk, said that when the original Precious Stones Act was passed in 1927, the Government had to guard against overproduction that could have led to a slump in the diamond market. However, in recent years the Union's output of diamonds had decreased in relation to that of other countries.

The Minister said that the purpose of the present Bill was to encourage diamond production in South Africa, to offer opportunities for prospecting and exploitation, and to provide some financial relief for diamond mines and miners.

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INDUSTRIAL DIAMOND ABSTRACTS

Industrial Diamond Information Bureau,
2 Charterhouse Street, London, EC 1.
Telephone : FLEet Street 1577

1960 Volume 17
FEBRUARY

DIAMOND MINING AND INDUSTRY

What is the future of industrial diamonds ?

Anon. *Diamond News* 1959 Vol 23 (2) pp 14-15 (Nov)

Decreasing world tension may reduce demand for industrial diamonds used in armaments manufacture, and although increasing precision work needed for missile production could not fill such a gap, the writer considers that the growth of new nations and the creation of new industrial activity will stimulate sales. Mining and engineering activity is also expanding, and research into further applications of industrial diamonds continues. Thus, it is concluded, the future promises remarkable development in the demand for and uses of industrial diamonds. 1 illustr.

D *Fc.131/Fc.1451*

Record diamond trade. Rekord-Diamantumsaetze

Anon. *Gold u Silber* 1959 Vol 12 (12) p 34 (Dec) (In German)

De Beers Consolidated Mines Ltd report that diamond purchases have reached a record height.

A *F.251*

De Beers and Pypklip proclamation

Anon. *Diamond News* 1959 Vol 23 (2) p 10 (Nov)

De Beers Consolidated Mines Ltd has invited tenders for owners' and discoverers' certificates over portions of the farm Pypklip, in the Lichtenburg district. The farm will shortly be proclaimed an alluvial diamond digging and the successful tenderer or tenderers will be able to select and work 235 owners' and 60 discoverers' claims demarcated by De Beers after extensive prospecting.

D *Eb.361*

Biggest diamond factory in USSR

Anon. *Diamond News* 1959 Vol 23 (2) p 17 (Nov)

Moscow Radio reports that the weight of diamonds mined in Yakut greatly exceeds that of previous years. Three diamond mining factories in the new town of Mirny are working at full capacity and a number of new diamond deposits were found in 1959.

D *F Hd.332*

The Kimberley story : Centre of diamond industry

C. B. Harris. *Diamond News* 1959 Vol 22 (12) pp 21-23 (Sep)

A brief general history and description. 2 illustr.

D *F.25.3612*

Possible diamond occurrences in placers on the western slope of the Urals

N. P. Verbitskaia, G. M. Gapeeva. *Razved i okh nedr* 1959 Vol 25 (3) pp 8-12 (Mar); *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (7) p 2052 (Oct) (Original in Russian)

D *F Hd.33*

New diamond distributors

Anon. *Min J* 1959 Vol 253 (6486) p 609 (Dec 11)

A report in *The Wall Street Journal* states that Engelhard Industries Inc has formed a division to import, process and distribute natural industrial diamonds in the US and provide technical research into their use. The company will crush and grade diamonds into abrasive grit. It will buy natural diamonds from De Beers, but has no plans to distribute synthetic diamonds.

X *Fc.251.342*

U.S. biggest industrial diamond consumer

Anon. *Diamond News* 1959 Vol 23 (2) p 30 (Nov)

The United States consumes about 60% of the world's output of industrial diamonds.

D *Fc.251.342*

Canada's mining industry in 1959

Anon. *Min J* 1960 Vol 254 (6490) pp 38-39 (Jan)

D *Cb.25.343*

International news : Venezuela

Anon. *World Min* 1959 Vol 12 (13) p 68 (Dec)

Diamond production in Venezuela dropped in 1958 because of a very long rainy season in Bolivar State and in the Amazonas Federal Territory, where the diamonds are washed from the river sands. Output totalled 89,565 ct compared with 122,598 ct in 1957.

D *Ebe F.13.347*

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Diamond—Republic of Guinea

Anon. *Miner Tr Notes* 1959 Vol 49 (6) pp 39-40 (Dec)

Diamond production reached 116,000 ct in 1958 and exports 120,000 ct, but these figures omit the activities of 'Bekima' an African co-operative in Guinea whose sales in 1958, all through illegal channels, are estimated at 75,000 carats. The Guinea Government reportedly abolished Bekima early in 1959 and gave its concessions to other diamond companies.

D *F.25.3671*

Diamond—Ivory Coast

Anon. *Miner Tr Notes* 1959 Vol 49 (6) p 40 (Dec)

Production of gem and industrial diamonds totalled 164,315 ct in 1958. *D* *F.25.3662*

Diamond—Sudanese Republic

Anon. *Miner Tr Notes* 1959 Vol 49 (6) p 40 (Dec)

The existence of kimberlite was confirmed during the latter part of 1958 following digging at Sekonomata. Exploration is being undertaken with modern geophysical, geochemical, and magnetometrical equipment.

D *Ebb F Hd.368*

Diamond—Union of South Africa

Anon. *Miner Tr Notes* 1959 Vol 49 (6) p 40-41 (Dec)

Tables show production and sales of mine and alluvial stones in the Union of South Africa for 1957 and 1958.

D *F.25.361*

Diamond trade in Australia

Anon. *Diamond News* 1959 Vol 22 (12) p 19 (Sep)

Import, export and production figures for 1956-1958. Australia imports industrial diamonds worth £400,000 annually: production has been nil since the gold dredge which produced by-product diamonds on the Macquarie River in NSW stopped operating in 1958. The chances of finding practicable quantities of industrial diamonds are considered remote.

D *F.251.38*

16% increase in Angola diamond production

Anon. *Diamond News* 1959 Vol 23 (2) p 28 (Nov)

D *F.25.3676*

French West and Equatorial Africa production

Anon. *Diamond News* 1959 Vol 22 (12) p 19 (Sep)

Production and export figures for 1958 compare unfavourably with those for 1957.

D *F.251.366/F.251.3662*

Diamondiferous jottings

Anon. *'Mindrill' Bits & Pieces* 1959 Vol 12 (6) p 6 (Oct)

Production figures and details of diamond producers in Belgian Congo and South West Africa.

D *Ebb.362/Ebb.365*

Mineral industry of Ghana. L'Industria mineraria di Ghana

Anon. *Industr min Ital* 1959 Vol 10 Ser II (11) p 773 (Nov) (In Italian)

The diamonds found are mostly industrials. They are sold by an official diamond market in Accra. Exports in 1956 amounted to 2,518,563 carats.

M *Fc.251.367*

LITERATURE REQUESTS

Please quote the page number of the journal which contains the original reference, and the author and title of the article, in all cases.

PHYSICAL, CHEMICAL, & MECHANICAL PROPERTIES OF DIAMOND

How good are micronized man-made diamonds ?

S. Kay, E. F. Warren. *Carbide Engng* 1959 Vol 11 (11) pp 20-21 (Nov)

In order to establish the results of micronizing synthetic diamonds, a firm specializing in producing and reclaiming diamond abrasive compounds carried out an investigation. Analysis showed synthetic powder to be better than 99.5% pure. Traces of what appeared to be graphite were noted and ash left in the combustion boat was probably iron oxide: however, the amounts involved were thought too small to be of any consequence.

One thousand carats of minus 325 mesh synthetic and the same quantity of minus 400 natural diamond were ball milled under identical conditions. It was found that the synthetic produced about 10% more superfines, which increases the cost of handling, and that it contained very little of the 30-60 micron range. In contrast, natural diamond contained more of this coarse range, suggesting that synthetic diamond is not as tenacious as natural diamond. The particle shape of synthetic diamond after ball milling was superior, *ie* blockier and without any panes and slivers. Natural diamond required longer and greater effort to produce a similar particle shape. It was concluded that synthetic diamond lends itself favourably to micronizing and grading.

Samples of graded synthetic diamond powder were sent to a cross-section of the diamond industry to test performance. On diamond dies, synthetics cut too slowly to be profitable and too much powder was used, but results equalled those for natural diamond. On carbides, synthetic proved as good as natural diamond, and on steels, with a wide range of tooling agents, the cutting action was identical, it is claimed.

The writers warn against over-emphasis on the lack of tenacity of synthetic diamond as presaged by the ball milling operation and later borne out in the most rigourous abrasive application of diamond against diamond with the use of a hard tooling agent, *ie* steel needle, as this was the only operation where synthetic did not stand up to natural diamond in the investigation. It is noted that, according to present trends, price rather than shortage will promote large-scale use of synthetic diamond powders in the United States. 5 illustr. *D* *Km*Kmh*

Electrical resistivity changes observed in a semiconducting diamond after heat treatment

K. E. Mutch, F. A. Raal (Diamond Research Lab, Johannesburg). *Nature, Lond* 1959 Vol 184 (4702) p 1857 (Dec 12)

Recent electrical resistivity measurements on several type II*b* diamonds have revealed that their electrical conductivity can be altered markedly by subjecting them to heat treatment. Initially, these diamonds were heated at 850° C for 70 hr in a vacuum of better than 10^{-5} mm mercury for the required effect; lately, however, the same change has been brought about by heating at 1,400° C for 3 hr in an inert atmosphere.

This communication describes one particular diamond, unique in that it consisted of a blue and a white portion, both of which were semi-conducting to different degrees and which were separated by a sharp, well-defined boundary. A method is described in which the electrical resistivity of each portion, unheated and heated, was measured. The authors' observations are recorded. 2 illustr, 3 ref. *D* *Fn Ue*

Ionization effects produced in diamonds subjected to mono-energetic β-ray bombardment

P. J. Kennedy. *Proc roy Soc* 1959 Vol 253 (1272) pp 37-51 (Nov 17)

The ionization produced within diamond specimens by the passage of high-energy β-rays has been investigated using methods of conduction pulse counting, and a new technique has been developed to enable pulse-height spectra to be taken, rapidly and in quick succession, under widely different experimental conditions.

It is shown that only a small proportion of the incident β-rays may dissipate their total energy within the specimen and that pulse-height spectra can be interpreted successfully only when a conduction pulse is related to the energy lost by the electron producing it. Under conditions of saturation field strength and low crystal polarization, the conduction pulse magnitude is proportional to the energy dissipated. The mean value of energy per ion pair is thus independent of the primary electron energy and the experimental value of 20 eV is shown to be remarkably consistent between diamond specimens.

This value differs from the previously accepted value of 10 eV and, if used in preference to 10 eV, removes many apparent anomalies from previously published work.

A theory is outlined in which it is proposed that the degradation of the primary electron energy takes place principally by interaction with the valence electrons of the crystal. The mean energy per ion pair depends, therefore, not only on the width of the forbidden gap in the solid, as previously suggested, but also on the width of the valence band and particularly on the position of the maximum in the density of states curve within the valence band. The available data for diamond suggest a value of approximately 18 eV for the mean ionization energy.

This value is consistent with the experimental value from the maximum pulse height under saturation conditions. The finite breadth of the pulse spectra, however, can be explained only by some charge-reducing process occurring after the total dissipation of the incident energy. The process is tentatively linked with the scintillation response of the diamond crystal.

Finally, criteria are suggested by which the conduction pulse response of various solids may be predicted. 8 illustr, 1 table, 18 ref. *A* *F Hxb*

Dislocations in germanium and silicon

H. G. van Bueren, J. Hornstra, P. Penning. *Nuovo Cimento* (Suppl) 1958 Vol 7 Ser X (2) pp 646-660; abstr *Philips tech Rev* 1958-59 Vol 20 (12) p 368 (Nov 12) (Nov 12)

This paper describes some recent work in Eindhoven on the subject of dislocations in the diamond structure and on the plastic deformation of its most important representative—germanium. Three topics are discussed: the nature of dislocations in germanium and silicon, the formation of dislocations by thermal stresses, and certain general aspects of the plastic deformation of germanium. *X* *Bfr Ubbz/Bhc Ubbz*

International Mineralogical Association

R. L. Parker. *Nature, Lond* 1959 Vol 184 (4703) pp 1909-1911 (Dec 19)

The second symposium of the first International Mineralogical Association meeting in Zurich had as its topic the twinning of crystals. Professor A. Neuhaus dealt with twinning in diamond, discussing some of the conflicting observations made on the subject. As a result of his own investigations, he considers it certain that a transition between two modifications occurs but believes that only one is isometric. His arguments are summarized. *D* *F Ube*

Diamond 'amelioration'

Anon. *Diamond News* 1959 Vol 23 (2) p 17 (Nov)

An American consular message says that the Idar-Oberstein Institute for Precious Stone Research has determined by spectromicroscopic examinations that formerly yellowish diamond has been 'ameliorated' by a coating technique developed by the North American industry. Though it is assumed that metals atomized in an electric field were used to coat the diamond, the nature of the coating could not be analysed.
D *F Hx Ukb.1312*

Note on the scratching of diamond

R. H. Wentorf jun. *J appl Phys* 1959 Vol 30 (11) pp 1765-1768 (Nov)

The resistance of diamond to wear is a strong function of its orientation. The observed facts can be explained by assuming that a scratched diamond surface fails in tension behind the scratching particle. The octahedral cleavage planes are most easily pulled apart and give rise to the strong dependence of wear on crystal orientation. 9 illustr, 5 ref.
A *F Ungd/F Unhb*

A strong absorption system in type I diamonds

F. A. Raal. *Proc phys Soc Lond* 1959 Vol 74 Pt 5 (479) pp 647-649 (Nov 1)

The fundamental absorption edge of diamond of both type I and type II is 2220 AU, but in type II diamonds a secondary absorption edge is super-imposed on the fundamental, being due largely to the presence of nitrogen as an impurity in substitutional sites in these particular diamonds. Type I diamonds fall into two groups according to their natural absorption bands. Group A consists of N_5, N_6, N_7, N_8 and the secondary absorption edge; Group B of N_2, N_3 and N_4. Characteristics of these and absorption coefficients were studied in experiments using very thin slabs of type I diamond. 2 illustr, 8 ref.
A *F Ukjc.21*

Two speakers review synthetic diamonds

R. I. Edwards. *Tool Engr* 1959 Vol 43 (6) p 98 (Dec)

Reports a meeting at which N. A. Matthews of GEC talked on progress in the manufacture of synthetic diamond. GEC is now experimenting with a process which makes diamond harder by rearranging the atomic structure of carbon.

R. A. Parke of the Atomic Division of Norton Co illustrated the arguments for using synthetic diamonds on grinding wheels. While admitting that natural diamond performed better for some applications, he stressed that both GEC and Norton were researching intensively to improve synthetic diamond for grinding wheels. *D* *Fh Ha*

Ultrahigh pressures

H. T. Hall. *Sci Amer* 1959 Vol 201 (5) pp 61-67 (Nov)

Laboratory apparatus is now capable of maintaining steady pressures of more than two million pounds per square inch. Under such extreme conditions matter exhibits new properties, *eg* diamond can be synthesized from graphite, and new minerals such as borazon and coesite have been produced. Graphite and synthetic diamond X-ray diffraction patterns are compared. 8 illustr.
A *B Ct Vcb/Bhb Uklb*Fh Uklb*

Spot news . . . trends

Anon. *Amer Mach* 1959 Vol 103 (25) p 69 (Nov 30)

GEC now claims that it is able to make 'blocky' shapes of synthetic diamond for metal-bonded grinding wheels. *D* *Nvh Urc*

Is synthetic diamond better than natural ?

Anon. *Metalworking Prod* 1959 Vol 103 (41) pp 1617-1624 (Oct 9)

GEC's successful efforts to produce synthetic diamond, and the manufacture and testing of grinding wheels using this synthetic grit by Carborundum Co, USA, are described. The results of laboratory and field tests are given and general observations made. 11 illustr.

D *Nv.1312*Nvh.1312*

Synthetic diamonds now in South Africa also. Nun auch synthetische Diamanten in Sued-Afrika

Anon. *Dtsch UhrmZtg* 1959 Vol 63 (12) p 610 (Dec) (In German)

De Beers Adamant Laboratory in Johannesburg, as a result of experiments begun in 1956, has produced its first synthetic diamonds, industrials up to 0.4 × 0.25 mm in size. *A* *Fh Ha.361*

2 new types of artificial diamonds discovered

Anon. *Diamond News* 1959 Vol 23 (2) p 10 (Nov)

The discovery of two kinds of artificial diamonds, claimed to be suitable for use as jewellery, is reported : 'Fabulite' produced in France from strontium titanate and 'Diamondite' produced in America. The diamond industry is so far unimpressed by the new products. *D* *Fh.3215*

De Beers Laboratory makes synthetic industrials

Anon. *Diamond News* 1959 Vol 23 (2) pp 7-9 (Nov)

The full texts are given of statements made by Mr. H. F. Oppenheimer and Dr. J. F. H. Custers when they announced in Johannesburg recently that De Beers Adamant Laboratory had developed a way of making synthetic industrial diamonds.

D *Fh Ha.361*

G.E. reveals . . . how man-made diamonds are made ?

GE Research Lab, Schenectady, NY. *Carbide Engng* 1959 Vol 11 (12) pp 9-10 (Dec)

4 illustr. *D* *Fh Ha*

PHYSICAL, CHEMICAL, & MECHANICAL PROPERTIES OF HARD MATERIALS

The machinability of metallic materials. Die Zerspanbarkeit der metallischen Werkstoffe

E. Bickel. *Schweiz Arch angew Wiss* 1959 Vol 25 (11) pp 393-397 (Nov) (In German)

The field of machining is narrowed down to those methods in which the chip-producing tool is of alloyed steel or sintered carbide, as more is known of these than of other methods and their use is more general. Machinability is studied under three groups : ability to be cut, scraped, and made even.

A *Bf Ceq Unp*

Materials . . . trends

Anon. *Amer Mach* 1959 Vol 103 (25) p 79 (Nov 30) ; *Ceramic Age* 1959 Vol 74 (6) pp 32-35 (Dec)

Orientated graphite, known as Pyrographite, is now available in commercial quantities. Because of its highly orientated crystal structure, this material is said to offer unique high-temperature characteristics. Thermal and electrical conductivity are strongly anisotropic. Other valuable properties are high density and impermeability to gases.

D *Bhb U*

Identifying precious stones (X). Wir Bestimmen Edelsteine (X)

Anon. *Gold u Silber* 1959 Vol 12 (11) pp 21-22 (Nov) (In German)

Another method of identifying stones is to use the Plato effect to see whether the refraction index of the stone is higher or lower than that of the immersion fluid. This method is impracticable for distinguishing from each other gems with a very high refraction index *eg* diamond, zircon, garnet. A special apparatus is used to discover the refraction index. 3 illustr.

A *Bb Ukk/F Ukk*

Identifying precious stones (XI). Wir bestimmen Edelsteine (XI)

Anon. *Gold u Silber* 1959 Vol 12 (12) pp 33-34 (Dec) (In German)

The occurrence of double refraction is considered. 3 illustr. *A* *Bb Cz/Bb Ukk*

Theory of the anomalous dispersion method of determining the structure and absolute configuration of non-centrosymmetric crystals

S. Raman. *Proc Indian Acad Sci Sec A* 1959 Vol 50 pp 95-107 ; *Bibliogr sci Pub S Asia* 1959 Vol 5 (11) col 308 (Nov)

M *Bd Cz Ubb.21*

Contributions by metal physics to the knowledge of structural phenomena of metals. Apporti della fisica dei metalli alla conoscenza dei fenomeni strutturali dei metalli

F. Gatto. *Metallurg ital* 1959 Vol 51 (11) pp 521-524 (Nov) (In Italian)

M *Bf Ubb*

Investigations into physics of solids by ultrasonic means. Ricerche sulla fisica dei solidi con tecniche ultrasonore

P. G. Bordoni, I. Barducci, M. Nuovo. *Metallurg ital* 1959 Vol 51 (11) pp 525-526 (Nov) (In Italian)

42 ref. *M* *Bz Uc.131*

Peierls stresses in metallic crystals. Sforzo di Peierls in cristalli metallici

M. P. Tosi. *Metallurg ital* 1959 Vol 51 (11) pp 527-529

3 illustr, 7 ref. *M* *Bf.Unq*

Ferrite in the Widmannstaetten system. A contribution to the unstable and stable characteristics in weldable structural steels. Der Ferrit in Widmannstaettenscher Anordnung. Ein Beitrag zum Umwandlungs- und Festigkeitsverhalten schweissbarer Baustaehle

A. Rose, A. Klein. *Stahl u Eisen Dusseldorf* 1959 Vol 79 (26) pp 1901-1912 (Dec 24) (In German)

Part of this detailed study is concerned with the structure and formation of ferrite needles. Samples with polished surfaces were orientated by means of a pyramid-shaped diamond indenter under a load of 300 gramme. 19 illustr, 28 ref.

A *Bfd Cv Nde/Bfd U*

Indium and Gallium

M. Schofield. *Min Mag, Lond* 1959 Vol 101 (4) pp 175-177 (Oct)

Physical properties and industrial applications are reviewed. *D* *Bfu Um/Bfu.1451*

Recent trends in crystallography

S. Ramaseshan. *Curr Sci* 1959 Vol 28 (9) pp 349-350 (Sep)

A *Vh*

Stationary states of an electron in the field of a hole in an ionic crystal

L. Hrivnak. *Czech J Phys* 1959 Vol 9 (6) pp 685-691 (In English)

2 ref. *M* *Ub*

A simple method of precise determination of the lattice constants of polycrystalline substances without the use of standards

B. M. Rovinskii, E. P. Kostiukova. *Soviet Phys, Crystallogr* 1958 Vol 3 (3) pp 383-385 (May-June) (Original in Russian)

3 illustr, 2 ref. *M* *Bd Ubb*

The silica-chemical principles for the production of quartz crystals. Die silikatchemischen Grundlagen der Herstellung von Kristallkunststeinen

B. Loecsei. *Silikattechn* 1959 Vol 10 (12) pp 589-595 (Dec) (In German)

7 illustr, 21 ref, 12 tables. *A* *Bcb Ut*

Gems, synthetic and imitation. Edelsteine, Synthesen und Imitationen

K. Schlossmacher. *Industr Kurier* 1959 (190) p 12 (Dec 8) (In German)

Synthetic stones are produced by chemical and technical methods, and are very close to natural products. Imitation stones are inferior in every way even to synthetics.

A *Bb.193*Bbb/Bbb Ct*

Leucite, a gem of volcanic origin

E. J. Guebelin. *Gems* 1959 Vol 9 (11) pp 333-335, 350 (Fall)

Occurrence, morphology, and physical properties are given. 5 illustr. *D* *Bbz*

Formations of minerals : physical properties

R. Jahns. *Gems* 1959 Vol 9 (11) pp 344-346 (Dec)

10 ref. *D* *Bc Ue*

Certain general rules regarding the reflection of light from crystals

F. I. Federov. *Soviet Phys, Crystallogr* 1958 Vol 3 (3) pp 325-327 (May-June) (Original in Russian)

It is established theoretically that when light is reflected from crystals of any type (transparent, opaque, magnetic, *etc*), for every direction of the normal in the incident wave there exists an unique pair of orthogonal directions of polarization in the incident wave which corresponds to another pair of orthogonal directions of polarization in the reflected wave. For these directions of polarization, the reflection coefficients assume maximum and minimum values. 6 ref.

X *Bd Ukg*

Ceramic materials—properties for structural uses

W. J. Knapp, F. R. Stanley. *Prod Engng* 1959 Vol 30 (38) pp 118-119 (Mid-Sep)

2 illustr, 1 ref, 1 table. *D* *Bl U*

DIAMOND TECHNOLOGY

First published 1942 as " Production Methods for Diamond and Gemstone." The second edition of this book by P. Grodzinski has been revised throughout and considerably enlarged. 840 pages, 486 illustrations, 94 tables, and indexes. From NAG Press Ltd., 226 Latymer Court, London W 6. 54s 6d, post free.

DIAMOND, ETC, IN INSTRUMENTS

Neutron diffraction instruments at a high-flux nuclear reactor

G. E. Bacon, R. F. Dyer. *J sci Instrum* 1959 Vol 36 (10) pp 419-421 (Oct)

A description is given of an assembly at a high-flux reactor of two instruments for neutron diffraction meaurements. One is a large instrument for use with polycrystalline samples : the other, much smaller, is for single-crystal work. An account is included of the associated in-pile equipment and shielding for producing the collimated beams of thermal neutrons. 3 illustr, 3 ref.

X *Uklz V W*

The horizontal electron diffraction camera ' EG '

B. K. Vainshtein, Z. G. Pinsker. *Soviet Phys, Crystallogr* 1958 Vol 3 (3) pp 358-361 (May-June) (Original in Russian)

An electron diffraction camera for the investigation of the atomic structure of crystals designed to operate at voltages up to 75 kv is described. The plates are 13 by 18 cm and the distance between the specimen and the screen is 700 millimetre. 2 illustr, 7 ref.

X *Bf Cz Ubb Uklc Wcf*

X-ray spectrometer

Anon. *Instrum Rev* 1959 Vol 6 (88) p 1654 (Dec 28)

The Solartron automatic X-ray fluorescent spectrometer XZ 736 identifies the various elements in mixtures, alloys and compounds, whether in solid, powdered or liquid form. This method of analysis is essentially non-destructive, and the sample leaves the machine unchanged. The spectrometer is unique in that two samples are irradiated at the same time : one is used for measurement, the other for reference. In this way, X-ray tube fluctuations, temperature effects and similar drift phenomena are obviated, it is claimed.

D *Wcqz*

Multi-channel photoelectric scanning instrument for sizing microscopic particles

B. B. Morgan, E. W. Meyer. *J sci Instrum* 1959 Vol 36 (12) pp 492-501 (Dec)

4 illustr, 10 ref, 6 tables. *D* *Vgf Wc*

For technical microscopy

E. Gelbke. *German Export* 1959 (17) pp 30-31 (Sep)

The Neophot, a large inverted camera-fitted microscope, is attached to the micro-hardness tester designed by Hanemann. This attachment consists of an apochromatic lens system with Vickers diamond, including optical load indications and micrometer eyepiece. 4 illustr.

M *Nde Wghc:Psc Wcm*

Surface roughness of hot and cold drawn steel tubes. Oberflaechenrauheit bei warm und kalt gezogenen Stahlrohren

H. Muehlenweg. *Stahl u Eisen, Dusseldorf* 1959 Vol 79 (25) pp 1844-1852 (Dec 10) (In German)

14 illustr. *A* *Ag Bfd Unf*

Measurements of surface roughness of cold rolled steel strips and of drawn steel wire and steel bars. Messungen der Oberflaechenrauheit von kalt gewalztem Stahlband sowie von gezogenem Stahldraht und Stabstahl

W. Lueg, U. Krause. *Stahl u Eisen, Dusseldorf* 1959 Vol 79 (25) pp 1837-1843 (Dec 10) (In German)

11 illustr, 2 tables. *A* *Az Bfd Cz Unf*

Simple electronic scanning system for the X-ray microanalyser

A. Bernard, D. Bryson-Haynes, T. Mulvey. *J sci Instrum* 1959 Vol 36 (10) pp 438-443 (Oct)

11 illustr, 8 ref. *D* *Vuz W*

Automatic control and programming system for single crystal diffractometry

L. Langdon, B. C. Frazer. *Rev sci Instrum* 1959 Vol 30 (11) pp 997-1003 (Nov)

The system has been designed for a neutron diffractometer, but it could easily be adapted for use with X-rays. 4 illustr, 8 ref. *D* *Wce*

Surface finish measurement reviewed

B. Piper, W. P. Callis. *Metalworking Prod* 1960 Vol 104 (1) pp 13-25 (Jan 6)

After defining surface roughness, the article discusses quantitative measurements, single-parameter instruments, multi-parameter measurements, and surface-finish specification. 15 illustr.

D *Unf.21*

A conference on X-ray diffractometry

M. M. Umanskii. *Sov Phys, Crystallogr* 1958 Vol 3 (3) pp 398-399 (May-June) (Original in Russian)

The main object of a conference at Leningrad, organized by the Committee on X-ray Diffraction, was to discuss the development of diffractometer techniques. Papers included reports on types of diffractometers, on the application of the URS-50 I to the investigation of single crystals and for precision measurement of polycrystals, and the possibility of investigations at small angles with the same instrument being used as a two-crystal spectrometer. *D* *Uklb*

New Brinell pincer. Neue Brinellzangen

R. Boeklen. *Von Werkzeugen u Werkzeugmaschinen* 1959 (17) p 28 (Dec) (In German)

The instrument is held in the hand and the pressure exerted is registered on a dial. Round objects up to 100 mm in diameter can be tested, with a load up to 750 kilogramme. 1 illustr, 1 table.

A *Pz Wghc*

HARDNESS AND WEAR TESTING

Method for testing machinability. Methodik der Zerspanbarkeitspruefung

H. Siebel. *Industr Anzeig* 1959 Vol 81 (36) pp 554-558 (May 5) (In German)

Various methods of testing are discussed. The influences on wear are those of the machine tool, the tools and materials used for the experiments, and the method and instruments used for measuring. All of these must be considered in the calculations. With regard to the tools used in the experiments, very careful preparation and finishing is necessary for accurate results. Silicon carbide wheels are used to grind the tools, which are then finished with diamond grinding wheels, generally of grain size 25 micron. It is essential to avoid any disturbance of the grain structure of the cutting material in this operation. The application of test results in practice is discussed. 7 illustr, 11 ref.

A *Al Chm Nv/Unp.1312.1456*

Hardness tester

Radio Corp of America, Industrial & Automation Div, 12605 Arnold Ave, Detroit 39, Mich. *Tool Engr* 1959 Vol 43 (6) p 114 (Dec)

Electronically operated, this instrument can be fed manually or receive parts directly from a processing machine. It automatically measures the hardness of piston pins at rates of up to 2,400 per hour and sorts them into acceptable and reject catagories. The pins are cross-fed under two standard hardness penetrators whose load can be changed for various scale ranges. The machine will test roller bearings, ball bearings and similar products. Penetrators may be diamond-tipped or ball pointed. 1 illustr.

X *Agg Cv Ndf Wgh*

On the micro-hardness of glass surfaces

P. Joos. *Z angew Phys* 1957 Vol 9 (11) pp 556-561; *Phys Abstr* 1958 Vol 61 No 7571; *J Soc Glass Tech* 1959 Vol 43 (214) pp 155A-156A (Oct) (Original in German)

An apparatus is described by means of which diamond scratches may be made on glass surfaces in a vacuum or in an atmosphere of water vapour. Scratching occurs by brittle fracture in a vacuum if the glass has been heated to remove moisture. In the presence of water vapour a different form of scratch is obtained in which plastic flow occurs. The transition from brittle to plastic scratching, after vacuum treatment, requires some time of the order of a few minutes after admission of water vapour to the system.

X *Bm Unhd*

Thermal plastic after-effects on the Vicker's indentation in glass

W. Diehl, R. Schulze. *Z angew Phys* 1957 Vol 9 (5) pp 251-253; *Phys Abstr* 1958 Vol 61 No 7570; *J Soc Glass Tech* 1959 Vol 43 (214) p 153A (Oct) (Original in German)

D *Bm Cvd Ud*

The Duromag, a hardness tester for flat testpieces. La Duromag, un duromètre pour plats

Anon. *Eurotec* 1959 (3) p 3 (Nov) (In French)

The instrument is simple to operate and will measure Rockwell B hardness with a ball of 1.58 and a load of 100 kg, and Rockwell C with a diamond and a load up to 150 kilogramme.

A *Cvd Ndg Wghc/Cveb Tdc Wgh*

Nondestructive testing

Anon. *Purchasing Week* 1959 Vol 2 (45) p 22 (Nov 9)

Definitions of ultrasonic, nucleonic, gamma and X-ray, and thermo-metric non-destructive testing methods.

D *Cy.1456*

Causes of scatter in hardness measurements. Comparative study of various indenters

A. Meallier, G. Aubrion. *Mém Sci Rev Mét* 1959 Vol 56 (3) pp 327-355; *Bull Brit non-ferr Met Ass* 1959 Vol 39 (365) p 585 (Dec) (Original in French, abstr in English)

Tests mainly carried out on special grey iron (Brinell approx 410). Order of preference of the indenters used (with respect to scatter); 10 mm diameter, 5 mm diameter, 2.5 mm diameter, WC ball, Vickers diamond. Statistical analysis of causes of scatter shows part played by surface condition, relative dimensions of indentation and grains, errors in reading.

X *Nde.21/Tdc.21*

Friction and wear. Reibung und Verschleiss

R. Schnurmann (Esso Research Ltd, Abingdon, Berks). *Erdoel u Kohle* 1959 Vol 12 (11) p 878 (Nov) (In German)

A *Ung/Unr*

Hardness conversion—Knoop vs Vickers

L. Emond. *Prod Engng* 1959 Vol 30 (38) p 38 (Mid-Sep) 1 illustr. *D* *Unh Vff*

USP 2,890,585 (May 2, 1956) **R. S. Albrecht, Crown Cork & Seal Co Inc**

Hardness tester

The tester is intended for the automatic examination of the strength of the coating on a coated article like a crown cork. Fig 1 is a front elevational view of the tester, Fig 2 a side view of Fig 1 (enlarged), parts being broken away. When the electric current is switched on, load 64 moves automatically from A to B while loading beam structure 74 turns simultaneously counter-clockwise under cam control, so that the ball indenter in holder 100 moves across specimen 112 on platform 110 rotated through driven shaft 124. Thus the indenter describes a 'phonographic' or spiral path over the rotating specimen while the load gradually increases. When a break-through occurs on the coating, the driving motor is automatically switched off, so indicating the hardness value. (17 claims, 7 illustr). Ref cited : 6 USP. *J* *Cvd Wghc.545*

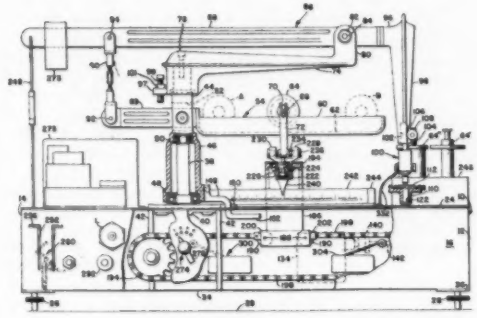


Fig 1 (above). A front elevational view of the tester.

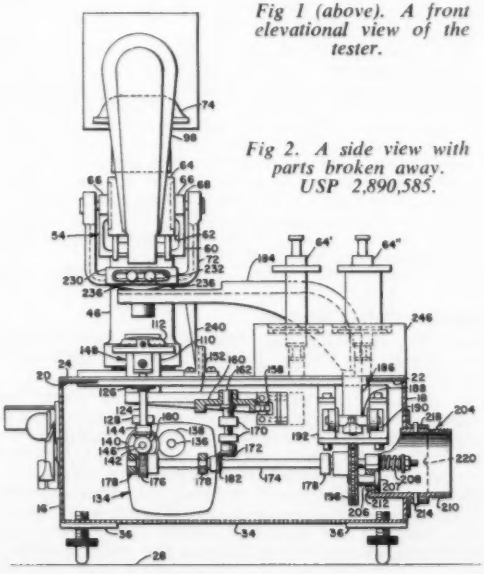


Fig 2. A side view with parts broken away. USP 2,890,585.

USP 2,892,344 (Nov 14, 1952) **D. F. Sklar, Torsion Balance Co**

Convertible hardness testers

The nitriding process for the surface hardening of steel requires a tester capable of measuring the hardness of the surface itself (superficial hardness), not the hardness of a thick layer. The regular Rockwell tester with a major load of 60 to 150 kg penetrates much too deeply for superficial testing, for which an initial minor load of 3 kg and a major load of 15 to 45 kg are suitable. A tester adjustable for regular testing and for superficial testing is obtained by replacing the strong and heavy power beam for a 150 kg load with a fabricated beam, which will not exert too much pressure on the indenter for superficial testing, but will be able to exert pressure up to 150 kilogramme. Fig 3 is a partly sectional view of the tester, Fig 4 a plan of the beam. Adjustment of the minor load spring 102 is effected by turning collar 84 to upper and lower positions while lugs 88 slide on ramp portions 78. (20 claims, 7 illustr). Ref cited : 13 USP ; 1 BP ; 2 FP ; 1 GP ; 1 Swiss P. See also USP 1,516,207/208. *J* *Bf Cvd Wghc.545*

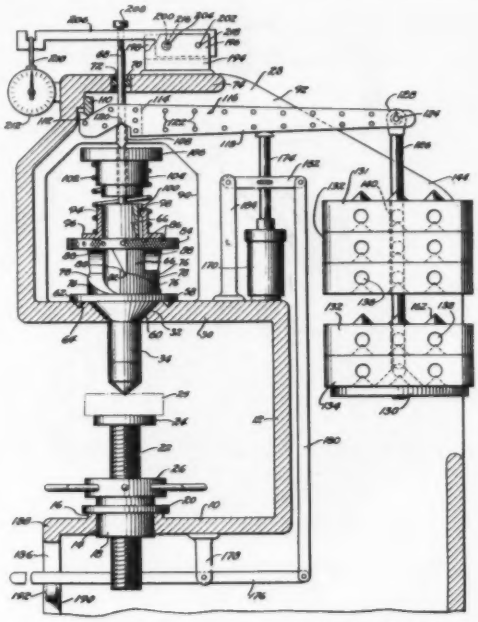


Fig 3 (above). The tester.

Fig 4. The beam. USP 2,892,344.

REQUESTS FROM AMERICA

American readers who wish to order a photostat or reprint of an article abstracted in Industrial Diamond Abstracts are advised to apply directly to the appropriate journal if this is an American publication.

USP 2,892,345 (Sep 27, 1954) **D. F. Sklar, Torsion Balance Co**

Inner face hardness tester

The Rockwell type tester is intended for testing the inside face of a partly open heavy, fixed, or other hollow structure such as a large journal bearing. Fig 5 is a central section through the tester and shows the

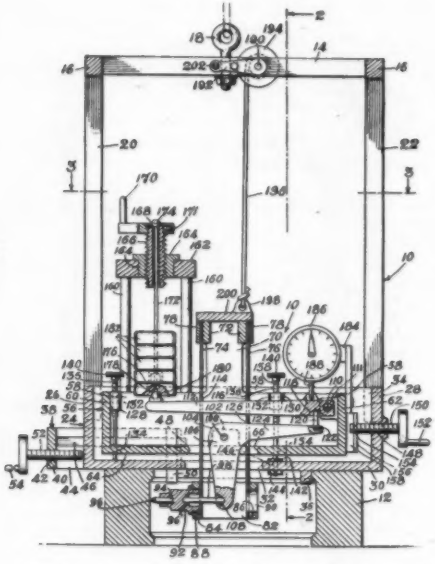


Fig 5. A central section through the tester. USP 2,892,345.

side members of an upright frame 20, 22 with cross pieces 14, 16 carried on the hook of a hoist for transport and placed on testpiece 12. Adjustment hand wheels 54 and 152 and crank handle 192 (on top) bring diamond point 96 into proper position. The indenter holder is mounted in flexible steel strips 74, 76. The load is transferred through a system of levers including elbow lever 104 fulcrumed on pin 100. (30 claims, 4 illustr). Ref cited : 8 USP ; 2 BP ; 2 GP ; 1 Italian P. See also : USP 1,516,207/208.

J *Bf Cvd Whgc.545*

TRUING OF GRINDING WHEELS

Lima engine plant lines rebuilt for new Falcon

Ford Motor Co, Lima, Ohio. *Mach Tool Blue Bk* 1959 (12) pp 125-129 (Dec)

The six Landis grinding machines that grind the connecting rod joints are equipped with Citco automatic diamond radius truers, so that a smooth fillet is maintained and the possibility of scuffing the bearings is reduced. Landis automatic contour grinders with Citco single point diamonds, which index after every pass, are used on the camshaft line. 6 illustr.

D *Chc Pr:Nj Psfc*

Methods and tools for producing cogwheels. Verfahren und Werkzeuge zur Herstellung von Zahnraedern

R. A. Schamschula. *Maschinenwelt u Elektrotechnik* 1959 Vol 14 (19-20) pp 476-481 (Oct) ; (21-22) pp 521-526 (Nov) ; (23-24) pp 570-571 (Dec) (In German)

The second part of the series is concerned with the formation of spurred and helical gears by means of honing, slotting with a slot wheel, milling with a roller milling cutter, and grinding. It also covers paring spurred and helical gears. The grinding wheels and worms used should be trued frequently with diamond truing tools. The third part is devoted to lapping the same gears to the formation of bevel gears. The lapping process is performed with a polishing dust combined with oil. Ordinary universal milling machines, roughing machines, and bevel grinding and milling machines are discussed, as are lapping methods and copying and roller methods, for producing bevel gears. The final part describes the production of worm gears and the sealing of gear wheels.

See also *Industr Diam Abstr* 1959 Vol 16 p 206 (Nov). 48 illustr.

A *Ab Cgf Nj/Ad Ceq*

Cutting disks produced in separate component parts

Anon. *Technica* 1959 Vol 8 (25) pp 1407-1410, 1415-1418 (Dec 4) ; (26) pp 1479-1480 (Dec 18) (In German)

The choice of the correct tool steel and the most satisfactory designs are discussed. Owing to the development of accurate truing tools and the use of diamond truing tools, parts can now be ground and polished to such fine tolerances that they are interchangeable. Oxy-acetalene flames may be used for welding the cutting inserts into the main parts of the grinding or cutting disk. In the production of cutting inserts and wheel segments for fine work, diamond grinding wheels and precision profile grinders are essential, and each minute change in the grinding wheel profile must be rectified immediately. The manufacture of cutting matrices and aids for the production of cutting dies are described. 27 illustr.

A *Ab Cg Nj/Al Chch Nv Pr*

Wickman-Scrivener No O centreless grinder

Arthur Scrivener Ltd, Tyburn Rd, Birmingham 24. *Metalworking Prod* 1959 Vol 103 (50) pp 2021-2022 (Dec 11)

This recently introduced model, a small precision centreless grinder, has a nominal capacity from 0.020 in. diameter and upwards. A feature of the machine is the hydraulically operated power-truing attachments for each wheel, which enable any desired straight, taper, or form profile to be obtained by fitting the appropriate former plate. On the control-wheel side, the attachment is fitted to the fixed member of the control-head slide, so that truing slide and diamond always move in a horizontal plane substantially parallel to the grinding wheel. Stepless variation of the traverse rate of both diamonds is also provided. 1 illustr.

D *Chcc Pr:Nj Psf*

Crankpin grinding machine

Newall Group Sales Ltd, Old Fletton, Peterborough. *Mach Lloyd* 1959 Vol 31 (25A) p 51 (Dec 12) (In English, abstr in German)

A crankpin grinder, for production of single and double throw cranks, is fundamentally a standard 12 in. swing cylindrical grinder with a special headstock and tailstock fixture which can be removed as a unit and replaced by a conventional workhead and tailstock for plunge cut and traverse grinding. A wheel dresser/former assembly houses a diamond which is hydraulically traversed for truing the wheel face. There is a motor driven crusher for forming the radii. 1 illustr.

D *Agn Chcl Pr:Nj Psfb*

'ontiac pinion production features spherical grinding

.. B. Arscott. *Machinery, NY* 1959 Vol 66 (4) pp 117-23 (Dec)

Generating of the spherical seat on the back face of each differential pinion is done on special Mattison grinding machines. Resinoid bonded aluminium oxide wheels are dressed to the required concave radius by a swing type diamond dresser mounted on the wheel slide. Only initial dressing is needed since the wheel stays sharp by self-dressing during normal operation. 9 illustr. *D* *Ab Bfgz Cg Nj Psfc*

New small grinding maschine. Neue Kleinschleifmaschine

E. Lang, Babenhausen, Hessen. *Industriekurier* 1959 Vol 12 (201) p 701 (Dec 31) (In German)

A new small grinding machine has a grinding range of 300 × 150 mm. Precision bearings ensure accuracy of the grinding spindle, and a timing device can be fixed on the spindle bearer for truing the wheel in any position. *A* *Chc Pr:Ab Cg Wp*

40 factors affecting grinding wheel action

E. C. Enos. *Grits & Grinds* 1959 Vol 50 (8) pp 3-9 (Aug)

A brief summary is made under forty sub-headings, several of which are devoted to truing and dressing. The distinction between crush truing and truing by diamond or other methods is stressed. Using the right size and shape of diamond, correctly orientated to the wheel, is important, as is the depth of cut and diamond infeed. 3 illustr. *D* *Cg Nj*Cgj*

BP 820,090 (Mar 26, 1957) **G. Zeise, G. Klingelnberg, G. Jaeger, H. W. Klingelnberg, C. Baum, (W. Ferd Klingelnberg Soehne)**

Method of, and apparatus for, the form dressing of grinding wheels

The grinding wheels to be accurately profiled are especially intended for the grinding of involute worms. A generator truing attachment is mounted in the workhead spindle of the grinding machine and is employed to true one flank of the grinding wheel. This grinding wheel flank is used to prepare a template by plunge cut grinding and the template is then used for controlling the form truing of the two flanks of the grinding wheel. Fig 6 and 7 show the generator truing attachment in front and side views with diamond 10 adjustable in rest 11 on slide 9 movable along guides 8. The diamond point is set by a gauge to the plane passing through the pivot of swivel arm 7 and also with vernier and slip gauges to the base circle radius 'rg'. The trued wheel flank then grinds template 18 as seen in Fig 8 and 9 mounted in swivel arm 17 in bracket 12. Fig 10 is a longitudinal section though the template truing arrangement with diamonds 50 and 51 controlled by template 36; diamond 61 trues the periphery of the wheel. (7 claims, 11 illustr).

J *Ab Cg Nj Psf.545/Mj Nj.545*

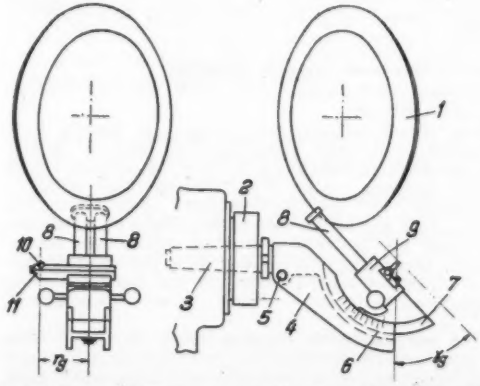


Fig 6 (right) and 7. Front and side views of the generator truing attachment. BP 820,090.

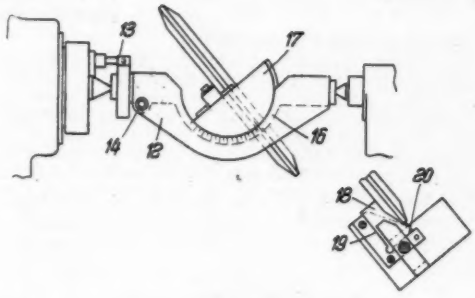
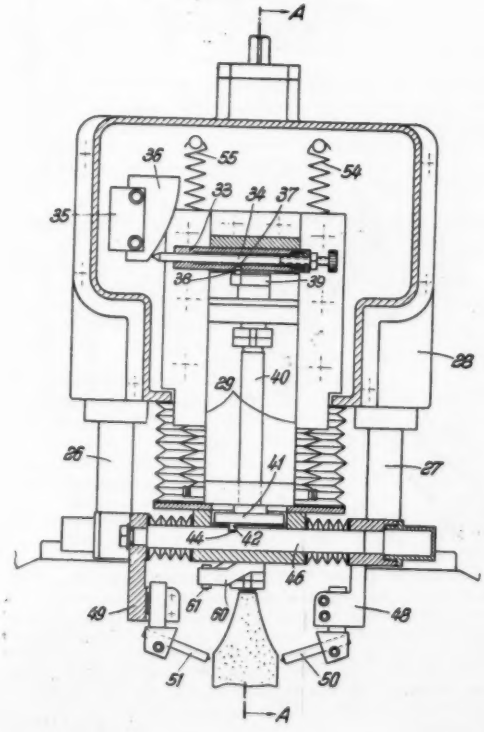


Fig 8 and 9 (above). Diagrams of trued wheel flank grinding template.

Fig 10 (below). Longitudinal section through template truing arrangement. BP 820,090.



BP 820,107 (Dec 2, 1957) **E. J. Wallace, L. Catallo, Wheel Trueing Tool Co**

Form dressing apparatus

Truing is effected by a truing tool of segmental cylindrical shape with a peripheral contour corresponding in reverse to that of the working face of the grinding wheel. This truing tool is oscillated arcuately about a fixed centre while engaged with the grinding wheel. The cutting surface of the tool is provided with a single particle thickness diamond layer of a fineness of 50 particles per ct and finer. (10 claims, 2 illustr).

J *Ab Cgh Psf.545*

USP 2,890,694 (May 22, 1958) **H. C. Miller, Super-Cut Inc**

Diamond dressing tool assembly

The truing diamond should be presented to the grinding wheel in a certain crystallographic orientation. It is also desirable that after wear the stone is automatically reset so as to be correctly orientated once more. The holder shown in Fig 11 and 12 is characterized by ball 32 clamped between recess 42 in stem portion 36 and clamping ring 34, with locating pin 28 in any of the grooves 22, 24, 26 in the bottom face

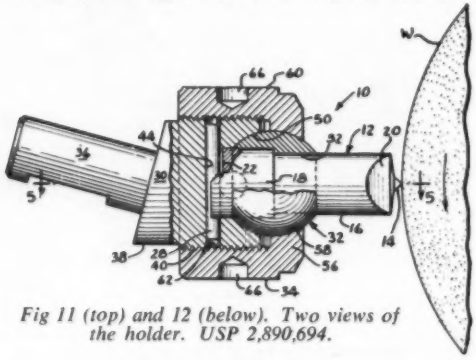
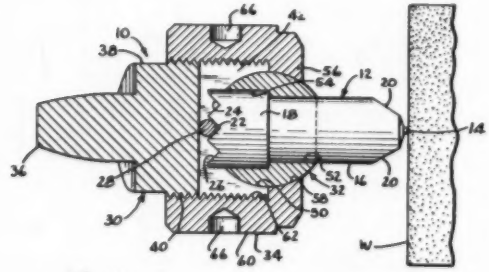


Fig 11 (top) and 12 (below). Two views of the holder. USP 2,890,694.



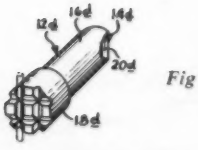


Fig 13 (left). Arrangement allowing displacements by rotation. USP 2,890,694.

of diamond shank 18. The arrangement of the grooves determines the angles of displacement of the tool shank from the centre line. In Fig 12 they permit angular displacements of 18° to either side. An arrangement as shown in Fig 13 enables displacements by rotation about 90 degrees. Flats 20 may be used as visual guides for proper rotational orientation. (13 claims, 11 illustr). Ref cited : 2 USP ; 1 GP.

J *Ab Cg Mf Nj.545*

USP 2,891,534 (Dec 12, 1956) **W. S. Omwake, Landis Machine Co**

Grinding wheel dressing mechanism

For truing, *eg* thread grinding wheels, a diamond carrying slide guided by a template may be used. However, the follower can only slide smoothly along the template if the flank angle of the thread repeated on the template has a certain minimum value. If the flank angle is too steep the follower may stick momentarily and this causes jerky movements. Grinding wheels for Acme and worm threads whose flank angles range from 10 to 20° require complex truing mechanisms. This disadvantage can be overcome by making the rectilinear motion between template and follower several times faster than the parallel relative motion between truing tool and grinding wheel, the differential in traverse velocity being effected by a ratio lever mechanism. (7 claims, 16 illustr). Ref cited : 2 USP ; 1 BP.

J *Ab Cg Nj.545*

PRECISION MACHINING OF METALS

Numerically controlled machine equipped with turning-boring and grinding heads

Ex-Cell-O Corp, Detroit 32, Mich. *Amer Mach* 1959 Vol 103 (26) p 147 (Dec 14)

Numera-Trol 922 contouring machine can be electronically or manually controlled in increments of 0.000,025 in. and has two self-contained, interchangeable machining units—one for turning and boring, the other for grinding. It is said to hold tolerances of 0.0001 in. in template production and 0.0002 in. in contouring operations. 2 illustr.

D *Ceqb Pr Wpz/Cfb Pr Wpz/Chc Pr Wpz*

Spot news

Anon. *Metalworking Prod* 1959 Vol 103 (52) p 5 (Dec 30)

A move to standardize tooling areas on general purpose milling machines, grinders, lathes, and drilling machines, so that fixtures and ancillary equipment for machines of comparable types and capacities will be interchangeable from machine to machine, is being backed in the USA by some 60 big companies who between them are said to represent about 90% of US machine tool purchasing power. Makers likely to be involved are to meet the standards proposers in March, 1960.

D *Pr:Pd.255*

Hundred operations saved by broaching

P. Trippe. *Metalworking Prod* 1959 Vol 103 (52) pp 2083-2090 (Dec 30)

The Royal Small Arms Factory at Enfield have adopted both bar broaching and normal surface broaching techniques for producing the complex shapes of components for the FN 7.62 mm rifle, previously produced by multiple milling operations. The advantages gained by surface broaching on a number of parts are analyzed and some typical case studies given. One example is bar broaching the trigger, which has eliminated seven milling and one surface grinding operation. 18 illustr.

D *Az Cfm Pr*

Use of semi-automatic copying lathes. L'uso di torni semi automatici a copiare

C. H. Stau. *Macchine* 1959 Vol 14 (12) pp 1207, 1209, 1211, 1213, 1215 (Dec) (In Italian)

13 illustr.

M *Ceqb Prsb*

Use and care of machines and sintered carbide tools in industry. Gebrauch und Pflege von Maschinen und Hartmetallwerkzeugen in der Industrie

P. Landberg. *Microtecnic* 1958 Vol 12 (4) pp 225-243; *Werkstattstechnik* 1959 Vol 49 (12) pp 768-769 (Dec) (In German)

The Laboratorium fuer Metallbearbeitung in the Technische Hochschule at Delft conducted research which revealed that the majority of lathes are seldom used to full capacity, sintered carbide tools are used at too low a cutting speed, and that diamond wheels can frequently be replaced by silicon carbide wheels for economy's sake. Correct methods of tool-care are described. 1 illustr.

A *Pdc.138/Prc.1451/Pr.138/Pr.1451*

Semi-automatic turning machine : Schiess KDA 60

Anon. *BSA Tools Div J* 1959 Vol 4 (3) pp 16-17 (Dec)

Designed for economic machining of a large number of workpieces of medium diameter and low turning height, the machine can use all cutting materials, including ceramic tools. 1 illustr.

D *Ceqb Prsb*

Ford piston lines retooled for Falcon's simplified six

R. H. Spiotta. *Machinery, NY* 1959 Vol 66 (4) pp 160-167 (Dec)

The pistons are centre drilled and milled, and oil-holes are drilled, counter drilled, and reamed on a 10-station transfer machine. Then an 8-spindle automatic turning machine faces the dome, cuts the ring grooves, and rough and finish-turns, using both inserted and solid carbide tools. Other operations include turning of the skirts to an oval shape of 0.011 in. with a taper of 0.002 inch. 11 illustr.

D *Agg Ceqb Pdc Prs*

Machining coaxial switch housings

R. Montgomery. *Mod Mach Shop* 1959 Vol 32 (7) pp 88-91 (Dec)

A Heald Model O Bore-Matic was selected for the machining of coaxial switch housings requiring tolerances of 0.001 inch. 3 illustr.

D *Az Ceq*

Spline on the arbor speeds milling rate

Pratt & Whitney Co Inc, West Hartford, Conn. *Carbide Engng* 1959 Vol 11 (11) p 19 (Nov)

A radical improvement in heavy duty milling performance, particularly in the machining of modern, high-strength alloys in the hardened state, is claimed for the new splined milling arbors and cutters made by Pratt & Whitney. Metal removal rates are reported increased by from 92% to 400% with cutter life increased proportionately. 4 illustr.

D *Cff Pr*

New Perkins outboard motor factory

F. Perkins Ltd, Peterborough. *Machinery, Lond* 1959 Vol 95 (2456) pp 1222-1224 (Dec 9)

Equipment in the cylinder block and crankcase line includes Wadkin high-speed milling machines; Archdale milling machines and single- and multi-spindle drills; Pollard single- and multi-spindle drills; and Johnson and Excello multi-spindle drilling, boring and tapping machines. 4 illustr.

D *Cfb Pr/Cff Pr*

Punched tape controlled drilling machine

Catmur Machine Tool Corp Ltd, 103 Lancaster Rd, London W11. *Mach Shop Mag* 1959 Vol 20 (12) pp 692-697 (Dec)

4 illustr. *A* *Cfb Pr Wpb*

Success with ceramics

D. Ward. *Mach Tool Blue Bk* 1959 (12) pp 111-114 (Dec)

Twin Disc Clutch Co engineers are happy with results achieved in surface finish, tool life and elimination of grinding. 4 illustr. *X* *Ceq Pdd*

Cutting wormshafts by thread-whirling

Steels Engineering Products Ltd, Crown Works, Sunderland. *Mach Shop Mag* 1960 Vol 21 (1) pp 21-22 (Jan)

4 illustr. *D* *Az Ceqbd*

Now it's vertical boring with tape control

Gray Tool Co, Houston, Texas. *Mach Tool Blue Bk* 1959 Vol 54 (3) pp 134-139 (Mar)

A Giddings & Lewis 54 in. vertical boring and turning mill is the world's first machine to incorporate continuous path numerical control for a turning type operation. For contour machining of oil field valves, the turret head, saddle, ram feed and traverse are under tape control as are power turret indexing and table speeds. 4 illustr. *D* *Cfd Pr Wpb*

Production microhoning of valve tappets generates 30 millionths-inch accuracy . . . eliminates boring

Anon. *Cross-Hatch* 1959 Vol 11 (3) pp 2-3 (Sep-Oct)

5 illustr. *D* *Az Chhc*

Shuttle machine drills and taps automatically

Buhr Machine Tool Co, Ann Arbor, Mich. *Tool Engr* 1959 Vol 43 (6) p 53 (Dec)

Drilling, chamfering and tapping of four holes on each side of a flywheel housing are done with an automatic machine. 2 illustr.

D *Cfb Prs/Cfbz Prs/Cfl Prs*

High speed threading with carbides

Gisholt Machine Co. *Tooling & Prod* 1959 Vol 25 (9) p 44 (Dec)

Describes the Cri-Dan technique for accurate high speed threading with carbide tools. Its main features are lathes with automatic, cam controlled slide movements and an arrangement for maximum rigidity of the supporting saddle. 2 illustr.

D *Ceqbd Pdc*

Ultra-fine hole driller offered for mill, drill press, or lathe

Hunter Tool, Whittier, Calif. *Amer Mach* 1959 Vol 103 (22) p 211 (Oct 19)

Hunter-Stanley small hole driller incorporates an Albracht micrometer chuck or the small Jacobs chuck. Accuracy of 0.0002 in. is claimed. 1 illustr.

D *Cfb Pr Psh*

Burr special-purpose boring machines

Ludwigsburger Maschinenbau GmbH. *Machinery, Lond* 1959 Vol 95 (2459) pp 1385-1388 (Dec)

Describes a number of Burr machines with special equipment for operations on a variety of workpieces. 6 illustr. *D* *Az Cfd Pr*

Tape-controlled driller soon recovers its cost

Vero Precision Engineering Ltd, South Mill Rd, Southampton. *Metalworking Prod* 1959 Vol 103 (50) pp 2003-2006 (Dec 11); *Control* 1960 Vol 3 (19) pp 105-106

The Vero Auto-Drill with Airmec Autoset electro-mechanical tape control is said to provide impressive economies on batch quantities at low capital outlay. By controlling the work position and the six-spindle turret head from a punched tape, the machine is capable of automatically drilling and tapping up to 600 holes of six different sizes in any order. 7 illustr.

D *Cfb Pr Wpb*

Machining stainless steel

G. J. Stevens. *Mod Mach Shop* 1959 Vol 32 (7) p 106 (Dec)

Change in geometry of drill solves chip clogging problem in drilling Type 410 stainless steel bar stock. 1 illustr. *X* *Bfdb Cfb Pl*

Transfer machine for die-cast cylinder heads

Buhr Machine Tool Co, Ann Arbor, Mich. *Mach Shop Mag* 1960 Vol 21 (1) pp 35-36 (Jan)

Describes complete drilling, chamfering, boring, reaming and tapping of die-cast aluminium cylinder heads on a specially designed Buhr transfer machine. 2 illustr. *D* *Agz Bfg Ceq*

Renault automatic honing and milling machines

Anon. *Machinery, Lond* 1959 Vol 95 (2495) pp 1392-1397 (Dec 30)

Describes a vertical honing machine with automatic loading, gauging and unloading equipment; and a special machine for milling four equally spaced slots in the ends of ball-joint caps for steering linkages. 8 illustr. *D* *Cfj Prs/Chh Prs*

Progress made in turning with aluminium oxide inserts. Progrès réalisés dans le tournage avec des plaquettes en oxyde d'aluminium

W. Dawihl, E. Klingler. *Mach Mod* 1959 Vol 53 (609) pp 20-25 (Dec) (In French)

11 illustr, 5 ref, 3 tables. *A* *Ceqb Pd Rj*

Boring compressor shafts

H. J. Pearson. *Aircr Prod, Lond* 1960 Vol 22 (1) pp 26-36 (Jan)

The accuracy of internal profiling operations usually depends on the use of an unsupported boring bar. The method described here makes use of a piloted boring bar and overcomes many earlier difficulties. The rigidity obtained allows a depth of cut of 0.30 in. to be taken in the tracer controlled profiling of high tensile steels. 13 illustr. *D* *Agz Cfd Pr*

Ultra-high-strength-alloys. Part II : Analysis of machining tests on representative American materials

J. Maranchik jun, J. V. Gould, P. R. Arzt. *Aircr Prod, Lond* 1959 Vol 21 (12) pp 429-433 (Dec)

This second article deals with problems of slot-milling, drilling, and tapping, when the alloys are of different degrees of hardness.

See also *Industr Diam Abstr* Vol 16 p A235 (Dec). 15 illustr. *D* *Bfx Ceq*

Some typical operations on components for business machines

R. Herriges. *Machinery, Lond* 1960 Vol 96 (2460) pp 24-30 (Jan 6)

Includes descriptions of broaching spacing racks and type magazines; drilling, reaming, counter-boring and tapping of cast aluminium typewriter chassis by a turret drilling machine; and deburring and lapping operations. 12 illustr. *D* *Az Ceq*

How Burroughs builds better business machines

R. Herriges (Burroughs Corp, Plymouth, Mich). *Machinery, NY* 1959 Vol 66 (2) pp 131-138 (Oct)

Unusual and close-tolerance stamping, broaching, drilling, and finishing operations are employed to produce high quality parts for a wide variety of business machines. 13 illustr. *D* *Az Ceq*

Metal cutting research challenge and strategy for the future

M. E. Merchant (Cincinnati Milling Machine Co). *Microtecnic* 1959 Vol 13 (5) pp 217-228 (Oct) (In English)

The author stresses the need for unified research, both basic and applied, and employing all the physical sciences and engineering, which will enable high strength, high temperature, high melting point metals to be utilized fully by industry. It is suggested that a company's research should be concentrated on the metal cutting process in a single department. The question is divided into such subjects as the control of machining costs, basic process research, metallurgy, physics, dynamics, physical chemistry, and applied process research. 17 illustr, 4 ref, 1 table. *D* *Bf Ceg.131*

Copy turning lathes [Pt I]

I. B. King. *Prod Engr* 1960 Vol 39 (1) pp 17-31 (Jan)

The paper is divided broadly into three parts: this first part describes, in general terms, the basic principles used in copy turning systems. 28 illustr, 14 ref. (To be cont). *D* *Ceqbz Pr*

Speed production with automatic boring and facing machines

Anon. *Mach Lloyd* 1959 Vol 31 (26A) pp 33-34 (Dec 26) (In English, abstr in French and German)

Flexibility in the precision machining of components of varied design and adaptability in coping with widely fluctuating outputs are the major claims advanced for three recently introduced automatic three-way boring and facing machines. Each consists of two double-spindle boring units and a cross-facing and boring unit. The machines are currently being employed in the production of single-speed and two-speed differential banjo housings for vehicles. Most of the operations carried out fall into the high precision class. 2 illustr. *D* *Cfb Prs Uqf/Chp Prs Uqf*

Throwaway-tipped core drills successful on hard alloy

Web Wilson Oil Tools Inc. *Tooling & Prod* 1959 Vol 25 (9) p 50 (Dec)

Wetmore gun type core drills with precision ground, square carbide throwaway tips, providing eight fresh cutting edges that can be renewed quickly at the machine, are used on a special 2-spindle horizontal, 2-position machine, to machine drill pipe tong parts. The operation consists of machining four holes, 1¾ in. diameter and 1½ in. long, in each part. Hole diameters are held to 0.0005 in. while the tools remove ¼ in. of metal in one pass from a rough cored hole in this cast part. Machining time is said to have been cut from 25 to 3 minutes. 3 illustr. *D* *Plb Rh*

Metallic materials and process development for airframe applications

S. G. E. Nash. *Prod Engr* 1960 Vol 39 (1) pp 32-44 (Jan)

Includes sections on machining processes, the spark treatment of tools, and machining of titanium alloys. 21 illustr. *D* *Al Ceqm/Bfxn Ceq*

Carbide mill bores tapers at 45,000 rpm

S. J. Kosterman. *Metalworking Prod* 1959 Vol 103 (42) pp 1651-1652 (Oct 16)

Tapered bores in a hardened armature shaft and spindle extension must be precision finished concentric with the supporting surfaces. This is done at Precise Products Corp on a specially designed machine with a carbide mill mounted in a high speed quill rotating at 45,000 rev/minute. 4 illustr. *D* *Agz Cfd Pdcz*

CUTTING AND MACHINING OF STONE, GLASS, ETC.

Fabricating 'sapphire tubing'

J. Cohen, T. G. Polanyi. *Rev sci Instrum* 1959 Vol 30 (11) p 1055 (Nov)

The conventional method of fabrication by machining and polishing with diamond dust was considered difficult and expensive, so an alternative was devised. An annealed rod of synthetic sapphire was slotted with a diamond cutting tool to produce an approximately parabolically cross-sectioned cavity with the apex at the rod axis. Another rod was wedged into the slot and the adjacent surface fused. The slight protrusion of the wedged rod was ground down with diamond dust and flame polished. The seal was found vacuum tight when tested at 10^{-5} Hg. The complete unit was produced at a cost roughly 3% of that incurred when conventional drilling methods were used. It is thought that this slotting and fusion technique could be used for larger tubing as well as for other shapes where the maintenance of a single crystal is not critical. 1 illustr, 3 ref.

D *Ag Bbdb Ceq*

An electron microscope study of synthetic graphite

I. M. Dawson, E. A. C. Follett. *Proc roy Soc A* 1959 Vol 253 (1274) pp 390-402 (Dec 15)

After an introduction on the structure of graphite and the observation of lattice defects by means of moiré fringes, experimental data is given. A method of cutting very thin sections with an ultra-microtome was developed. An embedded graphite block, 1 mm square, was trimmed to about one-tenth of this size and sections cut with glass knives. However, at present a diamond knife is being used and it is hoped that the much harder cutting edge will make it possible to cut along any lattice direction in carefully embedded material. This would yield information on the distribution of dislocations in all the lattice directions and thus permit determination of the number of edge dislocations due to the interpolation of extra hexagonal layer net planes. 15 illustr, 25 ref, 1 table.

D *Az Bhb Ceg Nfm/Bhb Wcmm.21*

Shaping ceramics with diamonds

Anon. *Optima* 1959 Vol 9 (4) pp 230-232 (Dec)

High density ceramic components needed for ultra-high-frequency electronic systems pose special machining problems: diamond grinding proved the solution at Raytheon Manufacturing Co, a major producer of microwave equipment demanding precise specifications. Tolerances of plus or minus 0.00025 in. must be held on some critical surfaces, and parts range from 4¼ in. diameter cylinders to 0.008 in. thick disks. The production of a part for a magnetron tube is used to illustrate improvements resulting from diamond grinding over other abrasives. A 6 in. diamond wheel ground the ceramic cylinders and paid for itself within a year; production was about 25 times faster; and quality was higher. 2 illustr.

D *Ag Bl Chc Nv*

Some typical operations on components for electronic equipment

ITT Laboratories, Nutley, NJ. *Machinery, Lond* 1959 Vol 95 (2456) pp 1207-1210 (Dec 9)

A special diode for amplifying microwaves is machined from single-crystal silicon which is then sliced on a Micromech precision wafering machine equipped with a 0.015 in. thick diamond saw. Wafer thicknesses range from 0.005 to 0.020 inch. The faces of the disks are lapped parallel on a Dallons lapping machine with an aluminium oxide abrasive. Next, the disks are ultrasonically cut into pieces of the required 1/16 in. diameter. The diode is completed by ultrasonically machining one face to produce a centrally located 0.003 in. diameter by 0.1002 in. high projection. Operations on other parts are described. 7 illustr.

D *Az Vhc Cej Ng*

Automatic slicing machine offers accuracy to tenths

DoAll Co, Des Plaines, Ill. *Carbide Engng* 1959 Vol 11 (11) p 40 (Nov)

The Microtom-atic slicing machine, Model MTA-7, designed for producing transistors, is also useful for slicing ceramics and the new tough materials used in missile and atomic power work. Thickness of the slices is said to be limited only by the cutter width and by the material characteristics. 1 illustr.

D *Az Bl Cej Pr*

GEC semiconductors

General Electric Co Ltd, Hazel Grove, Stockport. *Instrum Pract* 1959 Vol 13 (12) p 1243 (Dec)

In the production of germanium wafers, sorting can be done by means of an automatic prototype measuring machine which can deal with 1,200 wafers/hour. 3 illustr.

A *Az Bfr Cdd*

Precision polishing and turning machine. Feinwerk-Polier- und Drehmaschine

Anon. *Industr Anzeig* 1959 Vol 81 (102) p 1670 (Dec 22) (In German)

A machine suitable for grinding plastic as well as metal parts is described. 1 illustr.

A *Bf Chc Pr/Bp Chc Pr*

The machining of reactor materials

A. O. Schmidt, B. L. Richardson, J. R. Roubik. *Engrs' Dig* 1959 Vol 20 (12) pp 497-502, 521 (Dec)

Covers zircaloy-2, aluminium X-8001, mallory 1000, uranium and concrete. With aluminium a good surface finish and clean cut were maintained, as were the dimensions and straightness of the workpiece, by using tools that had been finished with diamond honing compounds to a 2 micro-in. r.m.s. surface finish. 10 illustr, 14 ref.

D *Bfg Ceq Pd:Chh Kmg*

Conditions of cutting in turning and milling glass

V. A. Fedotov. *Steklo i Keram* 1956 (3) pp 105-108; *LLU Transl Bull* 1959 p 72 (Dec) (Original in Russian)

A *Bm Ceg.21*

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I 252—A new method of determining the average shape of diamond and other particles, by J. F. H. Custers and F. A. Raal; A counting device for diamonds, by F. A. Raal, (*IDR* 1959).

I 253—Factors affecting the efficiency of resinoid-bonded diamond wheels, by R. G. Weavind (*IDR* 1959).

Grinder for sectioning solid diffusion specimens

H. W. Schamp jun, D. A. Oakes, N. M. Reed. *Rev sci Instrum* 1959 Vol 30 (11) pp 1028-1031 (Nov)

Describes a grinder that can be used for sectioning diffusion specimens in which the average diffusion distance is a very few microns. 4 illustr.

D *Bz Chc Pr*

Single crystal orienter

M. Schwartz, S. Nash, R. Zeman. *Rev sci Instrum* 1959 Vol 30 (11) pp 1055-1067 (Nov)

The paper describes a simple yet rugged specimen holder by means of which a single crystal may be aligned to two perpendicular axes of rotation. After the analysis of a Laue back reflexion photograph, manipulation of the apparatus permits cutting of the crystal along a desired crystallographic plane. Although no new principles are involved, it is thought that this orienter will be useful not only in studies of single crystals, but in other work related to X-ray diffraction. 1 illustr.

D *Bd Ubc W*

Transfer molding of complex alumina shapes

Anon. *Ceramic Age* 1959 Vol 74 (6) pp 16-21 (Dec)

Certain parts, particularly those to be used in hermetic seals, are machined to extremely close tolerances with diamond wheels after emerging from the kiln. 13 illustr.

D *Ba Ceq Nv*

USP 2,890,551 (Feb 20, 1956) **E. T. Dalton, American Optical Co**

Apparatus and method of forming ophthalmic lenses

The method refers to the simultaneous production of one-piece multi-focal lenses with a straight transverse line of division between the focal fields maintained at a practical minimum height and passing through the optical centres of the distance and reading fields. A lens blank of this type is shown in Fig 14 and the apparatus is represented in Fig 15 and 16. The lens blanks are fixed to block B by a suitable bonding agent. 51 and 52 are diamond charged cup-shaped abrading tools shown in more detail in Fig 17 and 18 while rough generating and fine generating the lens blank. Block and abrading spindles are rotated and the rotating block is automatically moved transversely, first into engagement with the roughing tool to an automatic stop and back after reaching the desired depth of cut, to be retracted and moved into engagement with the finishing tool where an automatic stop also limits the depth of cut. The block is then returned to the midway position and the rotation stopped. (9 claims, 14 illustr). Ref cited : 12 USP.

J *Bm Ceg Tfb.545*

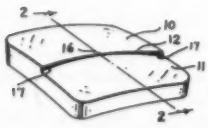
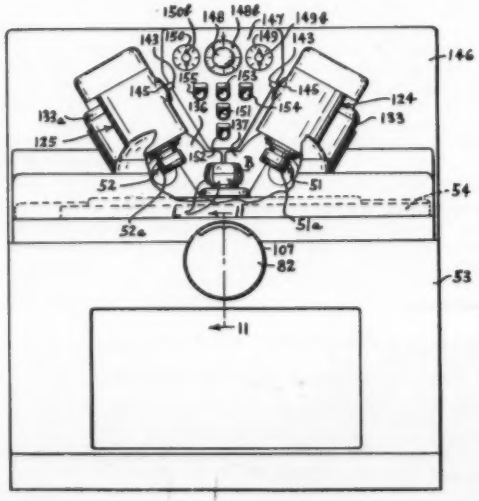


Fig 14 (left). A lens blank of the type described.

Fig 15 (below). The apparatus. USP 2,890,551.



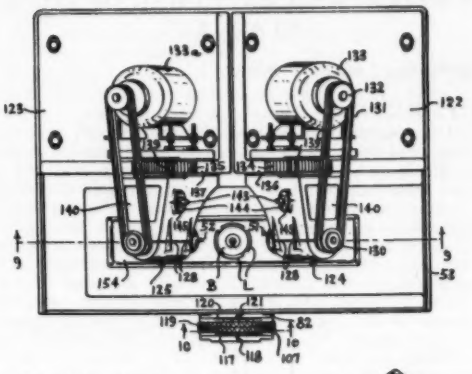


Fig 16 (top). Another view of the apparatus.

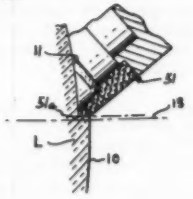
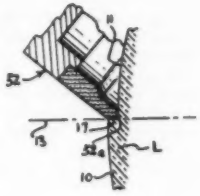


Fig 17 and 18 (left). Diamond charged cup-shaped abrading tools. USP 2,890,551.



USP 2,892,291 (May 14, 1959) **C. C. Coleman**

Holder for glass cutter

(8 claims, 7 illustr). Ref cited : 8 USP.

D *Bm Ceg Pd Psp.545*

DIAMOND TECHNOLOGY

First published 1942 as " Production Methods for Diamond and Gemstone." The second edition of this book by P. Grodzinski has been revised throughout and considerably enlarged. 840 pages, 486 illustrations, 94 tables, and indexes. From NAG Press Ltd., 226 Latymer Court, London W 6. 54s 6d, post free.

GEM POLISHING

New lapidary products

Bruce Products Corp, Howell, Mich. *Mineralogist* 1959 Vol 27 (12-1) pp 284, 286, 288 (Dec-Jan)

Research by Bruce Products Corp has now made available to the gem cutter a series of abrasive grits and polishing powders in cake or bar form. 'Bruce Bars' carry the various powders in solid form and are applied to buffs, sanders, and laps by touching the bar with the tool while the tool is operating. Various types of the product and its advantages over the other methods of applying a slurry mixture to the running tool are described. *D* *Bb Chm Rdb*

Diamonds — rare and costly. Diamanten — selten und kostbar

H. Berben. *Der Mittag* 1959 (288) (Dec 12) (In German)

Diamonds are the most valuable of gems, and the hardest, which makes special methods of cutting necessary. The technique still in use was invented by a Paris-born cutter, Louis van Berquem.

See also *Industr Kurier* 1959 (190) p 12 (Dec 8) (In German). *A* *F Hn*

The history of gemstone polishing in the upper Nahe and the Saar. Zur Geschichte der Schmucksteinschleiferei im Gebiet der oberen Nahe und der Saar

K. E. Wild. *Dtsch Goldschmiede Ztg* 1959 Vol 57 (12) pp 764-765 (Dec) (In German)

Book, Verein fuer Heimatkunde im Landkreis Birkenfeld, 72 pp, illustr. Price DM 4.80.

[Not in library of Industrial Diamond Information Bureau]. *K* *Bb Chm.28.322*

More about the big opal find

Anon. *Gemmologist* 1959 Vol 28 (340) pp 204, 214 (Nov)

It has not yet been decided how to cut the giant matrix opal found last May in Andamooka, South Australia; the decision will depend on the results of X-rays. If the X-ray shows that the matrix comprises clear blobs of opal, a plan will be drawn up of the best way to cut the matrix with a diamond saw. This is essential because the saw might grind to dust hundreds of pounds' worth of best opal.

D *Bbp Ubb*

ROCK DRILLING

Wire line coring : recent applications

Anon. *Diamond News* 1959 Vol 22 (12) p 7 (Sep)

Diamond drilling with wire-line coring has developed enormously in recent years and promises to improve core recovery and reduce exploration costs, both in the coal and other mineral industries. Basically, the wire-line coring technique differs from the conventional coring method in that a retractable inner tube is used. At the end of each core run, the core-laden inner tube assembly is hoisted to the surface through the drill string, as opposed to the conventional method wherein it is necessary to pull the entire drill string and core barrel in order to recover the core. The diamond bit, outer tube or core barrel, and drill stem can be left in the hole until the bit has become unserviceable or until the hole must be stablized. Thus net drilling time is increased. Applications of the technique are given.

D *Cfgz Nhe*

Diamond drill hole data

Anon. *Diamond News* 1959 Vol 22 (12) p 24 (Sep)

At the symposium held in London recently on the 'Use of borehole data in geophysical exploration', Mr. A. E. Levanto said that diamond-drilling with small-size bits is the most common exploration drilling method in Scandinavia.

D *Cfb Nh.213*

Gyro compass for diamond drill holes

Anon. *Diamond News* 1959 Vol 22 (12) p 24 (Sep)

A miniature gyro-compass, developed in the USA by the Minneapolis-Honeywell firm for use in guided missiles, is the size of a salt cellar and weighs only half a pound. It is expected that this instrument may be developed into a form suitable for use in diamond drill holes. *D* *Cfb Nh Wcz*

Complete core recovery

Anon. *S Afr Min (Engng) J* 1959 Vol 70 Pt 2 (3486) p 1449 (Dec 4)

Despite recent drilling advances, complete recovery of friable cores remains a problem. A device has been developed, however, which may be the answer for coal drilling and could possibly be used in core drilling as a whole. A polyester film is secured during coring within the inner band. After drilling, the core is removed complete as a unit. In various trials, 100% recovery is reported. *D* *Cfb Plb.131*

'Mindrill F 150' largest diamond drill of its type in the world designed and built in Australia

Anon. *'Mindrill' Bits & Pieces* 1959 Vol 12 (6) pp 2-3 (Oct)

The manufacture and testing of the largest diamond drill in the world has been completed by Mindrill Ltd. Capable of drilling either vertical or angle holes to depths in excess of 10,000 ft, initially it will be used for drilling 2¼ in. diameter holes. The major components are described, including head, hoist, brakes, engine and head frame. 1 illustr.

D *Nhe.38*

Dual rotation drill

Anon. *Min J* 1959 Vol 253 (6488) p 663 (Dec 25)

Claimed, in competitive demonstrations, to have drilled faster and to have finished blast holes when conventional reverse rotation machines could not do so, a new Joy 450-DR dual rotation drill has recently been marketed. Dual rotation, provided by a powerful vane-type air motor geared to the chuck, boosts normal drilling rotation and reduces strain on the rifle bar. Longer wear of parts and elimination of pawl wear are said to be advantages gained.

D *Cfbr Pl*

Machine eases diamond core drilling in concrete, masonry

Felker Mfg Co, 1128 Border Ave, Torrance, Calif. *Carbide Engng* 1959 Vol 11 (12) pp 32-33 (Dec)

A new Core-Lock diamond drilling machine uses surface-set diamond core drills and is adaptable to all angle drilling. Water coolant keeps diamond rims cool and flushes the kerf of sludge. The rough holes resulting from breaking through concrete, granite, *etc*, with conventional pneumatic equipment are said to be eliminated. 1 illustr.

D *Bn Cfb Nhe Pr/Bny Cfb Nhe Pr*

Canadian uranium

Anon. *Min Mag, Lond* 1959 Vol 101 (4) pp 207-208 (Oct)

Mentions diamond drilling for uranium ore.

D *Bfwb Cfb Nh.343*

This month in mining ; Quebec

Anon. *Engng Min J* 1959 Vol 160 (11) pp 164, 166, 170 (Nov)

Encouraging results are continuing in diamond drilling on the asbestos prospect of Murray Mining Corp in the Ungava area. Drilling has been restricted to one zone so far, but asbestos mineralization has been located on surface at spots along a length of over 30 miles. *D* *Cfb Nh.343*

This month in mining ; Idaho

Anon. *Engng Min J* 1959 Vol 160 (11) pp 140, 142 (Nov)

Hecla Mining Co is carrying out an exploratory diamond drilling programme in the American Silver extra-lateral rights area of the Coeur d'Alene district's silver belt. *D* *Cfb Nh.342*

This month in mining ; Ontario

Anon. *Engng Min J* 1959 Vol 160 (11) p 164 (Nov)

Initial deep diamond drilling at the copper property of North Coldstream Mines, Ontario, has extended the ore zone. The first hole, put down from the 800 ft horizon at 45°, returned a core length of 70 ft, of which 63 ft (45 ft true width) assayed 2.73% copper. *D* *Cfb Nh.342*

This month in mining ; Nova Scotia

Anon. *Engng Min J* 1959 Vol 160 (12) p 166 (Dec)

Conwest Exploration is diamond drilling to follow up a promising new zinc discovery on its 64-claim property at Bras d'Or Lake on Cape Breton Island. Widespread mineralization of clean sphalerite has been located in crystalline limestone formations. *D* *Bfj Cfb Nh.343*

This month in mining ; Colorado

Anon. *Engng Min J* 1959 Vol 160 (10) p 143 (Oct)

Diamond drilling is used at Denver Golden Oil & Uranium Co's Schwarzwalder mine, one of the outstanding producers of uranium ore in the US. *D* *Cfb Nh.342*

International news : Eire

Anon. *World Min* 1959 Vol 12 (13) p 63 (Dec)

Diamond drilling and drifting in ore at depth in the Mountain mine of Emerald Isle Mining Co is rapidly revealing a large tonnage of good grade copper ore. Initial diamond drilling has proved the presence of considerable recoverable ore above the 1,350 ft level, and also indicates that the ore-bearing veins will extend in depth far below the present workings. *D* *Bfh Cfb Nh.329*

Dustless rock drill

Le Roi Div, Westinghouse Air Brake Co. *Engng Min J* 1959 Vol 160 (12) p 44 (Dec)

A newly developed dust collecting system for use with hand held sinker drills can be used with any brand of rock drills, according to the manufacturer. 1 illustr. *D* *Bn Cfb Pl Ty*

Drilling symposium features exploration

Anon. *Engng Min J* 1959 Vol 160 (12) p 130 (Dec)

A drilling symposium held by the Universities of Pennsylvania and Minnesota and the Colorado School of Mines included papers on improved core recovery, one of which dealt with diamond bit design. *D* *Bn Cfb.541/Nhb.256*

Active rigs up 2.6% over 1958 figure

Anon. *World Oil* 1959 Vol 149 (6) p 28 (Nov)

Tables summarize US wildcat drilling and US drilling activity in general, over the periods August and September, 1959, and January to September, 1958 and 1959. 4 illustr, 2 tables. *D* *Cfb.342.513*

A half century of progress in metal mining—I

G. K. Allen. *Min Mag, Lond* 1959 Vol 101 (4) pp 153-169 (Oct)

Includes a section on drilling developments. Percussive drills usually have tungsten carbide bits. In soft ground the auger is popular, especially for short flat holes, but the diamond drill is rarely used for open-cast blast holes, despite its application for long-hole drilling underground. 9 illustr. *D* *Bf Cb.25:.132*

Climax designs new core-splitter

Anon. *Engng Min J* 1959 Vol 160 (10) p 120 (Oct)

Climax Molybdenum Co have developed a hydraulic core-splitter which consistently cuts solid cores into nearly perfect halves. The device is used in connection with their diamond drilling programme and is said to be far superior than the manually-operated core-splitter previously used. *D* *Bz Cec Prz*

Super drills for boring shafts and tunnels

J. H. Allen (Hugh B. Williams Mfg Co). *World Min* 1959 Vol 12 (13) pp 36-41 (Dec)

A paper given at the 9th Annual Drilling Symposium at Pennsylvania State University. 7 illustr, 3 tables, 4 ref. *D* *Cfb Pl.342*

USP 2,890,021 (Oct 29, 1956) **R. L. Sandvig, Thor Power Tool & Co**

Drill bit

The percussion rock bit is reciprocated at high speed and operates with suction of air through the central bore. The drill steel is of polygonal cross section, the circumferentially spaced flats providing air channels to the conical end. Thus the air can travel down the drilled hole and around the bottom through ducts in the drill between the tungsten carbide cutting edges, and then up into the bore in the drill steel with an effective chip-clearing and scouring action. (4 claims, 4 illustr). Ref cited : 4 USP ; 1 Austral P ; 1 DBP. *J* *Bn Cfbf Pl.545*

USP 2,890,858 (June 18, 1957) **R. Smith**

Deep well chain saw

(4 claims, 11 illustr). Ref cited : 5 USP. *D* *Az Cfd.26.545*

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I 253—Factors affecting the efficiency of resinoid-bonded diamond wheels, by R. G. Weavind (*IDR* 1959).

DAS 1,059,378 (Oct 26, 1956) **K. Rosenwald, Simens-Schuckertwerke AG**

Rotary drill bit with hard metal inserts in the cutting wings. Drehbohrschneide mit Hartmetalleinsaetzen in den Schneidenfluegeln

The usual rotary hard metal drill bits, *eg* those used for blast hole drilling, have inserts mounted vertically in the cutting wings. They need frequent regrinding which means heavy loss of hard metal. As Fig 19, 20 and 21 show, the new inserts are inclined to the drill axis to form a V-shape. Their thickness is only 40 to

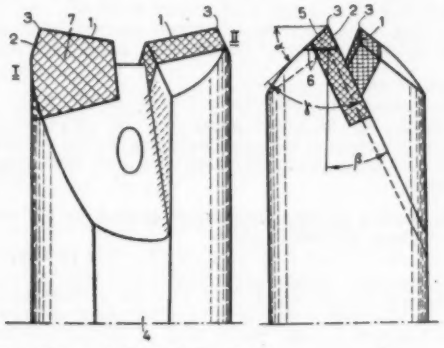
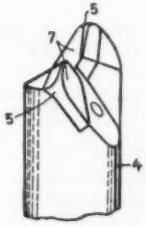


Fig 19 (top, left), 20 (top, right), and 21. The new inserts, showing inclination to the drill axis to form a V-shape. DAS 1,059,378.



60% of the usual thickness of vertical inserts and they are ground so as to form sliding faces 5 at their outer ends and to cut with a negative angle. The inner cutting edges are 1, the outer edges 2 at an obtuse angle with each other, while 3 are cutting points close to the wall of the hole. The bottom of the hole is conical, as in core drilling, facilitating the breaking off by the inner cutting edges. The negative angle β (Fig 20) is a good protection against cracks in the hard metal inserts, permitting lesser thickness. Faces 7 need not be reground, and the bit needs hardly any grinding. (4 claims, 5 illustr). Ref cited : 1 Belg P ; 1 Swiss P ; 2 USP ; 4 periodicals.

J *Az Cfd Pdch.545*

Drilling and rough polishing machine for diamond and sintered carbide drawing dies. Bohr- und Vorpoliermaschine fuer Diamant- und Hartmetallziehsteine

Anon. *Draht* 1959 Vol 10 (11) p 596 (Nov) (In German)

The Soldixa type KS 10/6 with six spindles will machine diamond dies of 0.030 mm to 1.5 mm diameter and sintered carbide dies of 0.08 mm to 2 mm. It consists primarily of the control box, housing the motor drive for the die plates, which are on ball bearings, and the headpiece. On the headpiece, at the back end, is the bearing for the eccentric shaft which is driven by the motor, and in front of this are the needle bearings. The turning motion of the shaft causes the up-and-down movement of the needles. Special collets ensure that the needle is firmly gripped in the holder, and this is held under the pressure of an adjustable spring. A control screw determines the position of the needle in accordance with the conditions and finish required. For a perfectly conical drilling and polishing process the needles must be ground mechanically on special conical grinding machines (type KS 19a). 1 illustr.

A *Ax Bkc Cfb Pr/Ax Bkc Chm Pr/Fc Hqb Nkb/Fc Hqh Nkb*

Durability of diamond drawing dies for the production of ultra-thin wires. Haltbarkeit von Diamantziehsteinen zur Herstellung von mikronenduennem Draht

G. P. Gwosdyk, N. F. Andrianow. *Stal* 1958 (9) pp 839-842 ; abstr *Draht* 1959 Vol 10 (12) p 683 (Dec) (Abstr in German)

The results of various tests on resistance alloys of high and low carbon content to find the durability of diamond drawing dies are given in detail. The higher the annealing temperature and drawing speed, the less the non-viscous elements in the metal and the smaller the diameter of the wire, the greater will be the durability of the drawing die. When first used, the durability of drawing dies is noticeably lower but it increases with further use and with higher drawing speed. Durability is greater on small reductions, but a greater number of drawing dies must be used.

K *An Cn Nkb Unz*

Crystallography of diamond die life

Anon. *Wire & Wire Prod* 1959 Vol 34 (10) p 1363 (Oct)

Diamond wire drawing die performance can be greatly improved by considering the crystal structure of the diamond before drilling. X-ray diffraction equipment has been used to study crystal orientation of stones before they are drilled, and one wire mill which used this equipment found die life was increased and more exact tolerances were achieved. The same procedure has been valuable in the manufacture of fine diamond cutting tools.

D *Nkb:F Ubb*

WIRE DRAWING

Dies and lubricants in drawing aluminium

Anon. *Wire & Wire Prod* 1959 Vol 34 (10) pp 1363, 1365 (Oct)

In drawing aluminium wire finishing speeds of 500 to to 5,000 ft/min are common, depending on wire size, speed being more or less a function of final diameter. Tungsten carbide dies are used for wire down to 0.050 in., and diamond dies for the finer gauges.

D *An Bfg Cn Nkb/An Bfg Cn Pxb*

GRINDING AND POLISHING OF CARBIDES AND METALS

Double horizontal spindle disc grinder

Besly-Welles Corp, 120 Dearborn Ave, So Beloit, Wis. *Mach Tool Blue Bk* 1959 Vol 54 (3) p 194 (Mar)

The DH 4 grinds economically parts such as bearing races, piston rings and gear blanks, and materials such as steel, cast iron and non-ferrous metals. Accuracy to tenths and automatic truing and sizing are among features mentioned. 1 illustr.

D *Az Chc Pr*

Technical progress in turning, grinding, tooth grinding and reaming. Der technische Fortschritt im Drehen, Schleifen, Verzahnen und Raeumen

A. Schatz. *Werkstattstechnik* 1959 Vol 49 (12) pp 702-719 (Dec) (In German)

A number of lathes is reviewed, which use both mechanical and electro-hydraulic control methods. Grinding machines include the special honing machine manufactured by Nagel GmbH on which very small holes are finished with diamond individually, without holding up the general flow of work, and a specially fine tool with diamond abrasives which gives the finishing polish to parts already drilled with a coarser diamond tool. A machine for cutting and sharpening sintered carbide and ceramic oxide cutters is produced by Fritz Wendt KG. It uses a bronze-bonded diamond grinding wheel, specially shaped for producing the correct form and chip step angle. The machines for turning, grinding and reaming were all exhibited in the 1959 Paris Exhibition. 56 illustr, 15 ref.

A *Az Chm Nqe:Chh Pr/Ceqb Pr/ Nv Urc:Al Bkc Chc Pr/Nv Urc:Al Bl Chc Pr*

Hunt twist drill point grinding machine

Herbert Hunt & Sons Ltd, Elsinore Rd, Old Trafford, Manchester. *Machinery, Lond* 1959 Vol 95 (2457) pp 1291-1292 (Dec 16)

Two twist drill point grinding machines are essentially similar, but one has No 5 Morse taper shanks and a capacity for drills from ¼ to 3 in. diameter, and the other, with No 6 Morse taper shanks, is for drills from ¼ to 4 in. diameter. The drill point is finished at a single pass across the face of a 10½ in. diameter cup-type grinding wheel, on which a flat face is retained without needing frequent dressing. A point thinning attachment incorporated in the machine has a 4 in. diameter straight cup wheel, and can be swivelled in both vertical and horizontal planes. Provision is made for raising the grinding wheel to enable the web of the drill to be thinned to suit any type of work material. 1 illustr.

D *Alb Chc Pr*

Lathe tool for honing straight or cranked shafts

Nicol & Andrew Ltd, Hillington, Glasgow SW 2. *Engrs' Dig* 1959 Vol 20 (12) p 520 (Dec)

Suitable for honing and superfinishing straight, cranked, and multi-diameter shafts, the Lathe Hone consists of a split head which carries four abrasive stones in shoes and which is clamped around the work-piece on the lathe. A centre-spindle attached to a hand screw adjustment passes through a main support rod, permitting fingertip control of the pressure of the abrasive stones on the workpiece. 1 illustr.

D *Chh Pgk*

Nagel automatic transfer-type honing machines

Nagel GmbH, Nuertingen, Germany; English Rep: Wickman Ltd, Coventry. *Machinery, Lond* 1959 Vol 95 (2457) p 1276 (Dec 16)

A 9-station machine does twelve operations, including drilling and honing, on brake master cylinders in a floor to floor time of 30 seconds. Finish honing for polishing the bore is carried out at a separate station under the control of an automatic timing attachment. A single spindle machine is primarily for honing wheel brake cylinders. The honing cycle takes 15 to 20 sec and removes 0.004 in. of metal from the workpiece bore. 2 illustr.

D *Chh Prs*

Delapena honing machines

Anon. *BSA Tools Div J* 1959 Vol 4 (3) p 13 (Dec)

Included in the range are horizontal and vertical type machines, beam stroking machines, special machines, and a full range of machine equipment. 1 illustr.

D *Chh Pr*

Burn-free, burr-free dry grinding of high speed steels

King Graphite Products Inc, Trenton, Mich. *Mach Tool Blue Bk* 1959 (12) pp 134-135 (Dec)

A new treatment for grinding wheels retards loading and functions as a dry coolant. Once the wheel has been impregnated by dipping in Dri-Kool, its pore surfaces throughout become coated with a parting medium. This solid lubricant prohibits the chip metal from gripping the abrasive and bond surfaces with the usual affinity. Improved results are reported when grinding HSS broach tools with treated wheels. Complete loss of burn or excessive heating on the dry grinding of M-3 type HSS, higher wheel life, and faster cutting are among the advantages claimed. 4 illustr.

D *Bfdb Chc*

Tools at work

Anon. *Tool Engr* 1959 Vol 43 (6) pp 64-66 (Dec)

Describes finishing operations on high-precision angular contact bearings, including precision lapping of previously ground faces of inner and outer rings. 7 illustr.

D *Ay Chd*

Belt grinding provides economical method for reclaiming marred aluminium plates

Anon. *Mod Mach Shop* 1959 Vol 32 (7) p 95 (Dec)

Aluminium sheets are re-surfaced with a coated abrasive belt to which 36-grit silicon carbide abrasive is bonded with resin over glue. The roughing operation is followed by two passes with a 120-grit aluminium oxide closed coat paper belt, sprayed lightly with mineral oil. Resulting finish is said to be at least equal to original finish. 1 illustr.

D *Az Bfg Chc Pee Rgc*

Tracer-controlled machine grinds missile parts

Bullard Co, Bridgeport, Conn. *Mod Mach Shop* 1959 Vol 32 (7) pp 126, 128 (Dec); *Amer Mach* 1959 Vol 103 (26) p 149 (Dec 14)

A new precision contour grinder, model 75, with three-output tracer control, has an automatically swivelling head as well as the conventional two-axis control over the horizontal and vertical grinding head feeds. One template can be used instead of three. The grinding wheel face can be kept tangent to the surface of the work at all times and this line contact grinding is not only extremely fast but is said to give a smoother surface finish. Reduction of wheel wear, less frequent or severe dressing and consequent long wheel life are among advantages claimed. 2 illustr.

D *Az Chcb Pr*

The advantages of standardization applied to grinding wheels. Les avantages de la standardisation appliquée aux meules

Anon. *L'Usine Belge* 1959 Vol 36 (166) p 10 (Dec 12) (In French)

A *Pe.255*

Development of complex automatic shops to manufacture rotating components

D. G. Lyudmirskii. *Machines & Tooling* 1959 Vol 30 (8) pp 15-20 (Original in Russian)

An article on the possibilities of designing automatic lines for machining rotating components describes equipment modified for this purpose. In the automatic flow line for the manufacture of anti-friction bearings, internal grinding machines make up from 25-35% of the total number of machines. An automatic semi-finish grinder is being developed for grinding tapered bores in races with basic outside diameter of 100-200 millimetres. The size of the ground bores will be determined by the given traverse of the grinding wheel after diamond dressing. 8 illustr.

D *Ab Cg Nj/Ay Chcn Prs*

Improving diamond wheel efficiency

R. G. Weavind. *Tool Engr* 1959 Vol 43 (6) pp 78-80 (Dec)

Synthetic diamonds give somewhat better results than natural diamonds in resinoid-bonded wheels. This superiority is due to the greater friability of synthetic diamonds. Tests show, however, that natural diamonds in needle and plate forms give equally good results and that natural diamonds in block forms are superior for applications where metal-bonded wheels are used for production. 2 illustr.

See *Industr Diam Rev* 1959 Vol 19 (224) pp 126-127 (July); (225) pp 146-153 (Aug).

D *Fc Nv*Fh Nv*

Chapter 125 hears summary of abrasive polishing and grinding

L. R. Chapman. *Tool Engr* 1959 Vol 43 (6) p 97 (Dec)

A report of a talk by J. L. Rice of the Behr-Manning Co on coated abrasives, defined as a product consisting of abrasive grains held firmly to a flexible backing support of adhesive, gives advice on using them to their best advantage. *D* *Pe Rd*

The manufacture of Everest office machines

Serio, SpA, Crema, Italy. *Machinery, Lond* 1959 Vol 95 (2457) pp 1257-1264 (Dec 16)

Operations described include surface grinding of small parts by an Ebosa surface grinder, and semi-automatic reaming with adapted machines. 13 illustr.

D *Az Cel Prsb/Az Chcm*

Design and use of modern side-milling cutters with HSS or sintered-carbide cutting edges. Konstruktion und Einsatz neuzeitlicher Scheibenfraeser mit HSS- bzw Hartmetallschneiden

H. J. Burmester. *TZ prakt Metallbearb* 1959 Vol 53 (8-9) pp 287-290 (Nov-Dec) (In German)

In the finish grinding of sintered carbide cutting edges, diamond wheels are recommended for turning and cutting quality. 7 illustr, 5 ref, 5 tables.

K *Al Bkc Chc Nv*

Lapping machine surfaces crankshafts

Norton Co, Worcester 6, Mass. *Mach Tool Blue Bk* 1959 Vol 54 (3) pp 206-207 (Mar)

The No 31 Crank-O-Lap crankshaft lapping machine, which is claimed to produce fine surface finishes by means of coated abrasive strips, is designed for fine surfacing external diameters of automotive type crankshafts. It laps pins and bearings simultaneously in an automatic cycle to low micro-inch readings. The machine may be used to improve the finish on other types of parts. 1 illustr.

D *Agn Chd Pr*

Superfinishing operations on automatic transmission parts

Buick Div, General Motors Corp, Flint, Mich. *Machinery, Lond* 1959 Vol 95 (2458) pp 1321-1325 (Dec 23)

Various types of machines are used for finishing both internal and external surfaces, which may be either flat or round and continuous or interrupted. 8 illustr.

D *Az Chs Pr*

German centerless grinders offered in four models

E. R. Bachman Co Inc, 27-11 41st Ave, Long Island City 1, NY. *Amer Mach* 1959 Vol 103 (22) p 194 (Oct 19)

Herminghausen centreless grinders are now available in four sizes, the latest being the SR 3 with a wheel 15¾ in. diameter by 7 in. face width. Features of the line include infinitely variable regulating wheel speed, and swivelling mounted bracket for precision adjustment of the grinding throat. 1 illustr.

D *Chcc Pr.322*

Electrolytic polishing

Anon. *Metal Ind, Lond* 1960 Vol 96 (1) p 1 (Jan 1)

Discusses a paper by Dr. H. Zentler-Gordon which traced the development of electrolytic polishing in this country. While the finish produced by this method cannot be substituted for the best mirror hand polish, the process shows substantial savings when applied to small, intricately shaped parts, especially when combined with hand polishing.

D *Chmk.132*

Electrometallic-bonded diamond tools

Diagrit Diamond Tools Ltd, Staplehurst, Kent. *Machinery, Lond* 1959 Vol 95 (2459) p 1388 (Dec 30)

An extensive range of electrometallic-bonded diamond tools is now being marketed by Diagrit Diamond Tools Ltd. These tools include plain and flared cup wheels; internal grinding points from 0.020 in. diameter upwards; profile grinding wheels; coated wires for jig grinding: peripheral wheels up to 12 in. diameter; chip grooving wheels; hand laps and hones; various machine files; and standard needle files.

D *N Urc*

Broaching dovetail grooves in ordnance components

A. Forberg. *Machinery, Lond* 1959 Vol 95 (2459) pp 1375-1377 (Dec 30)

Accurate dovetail slots of good surface finish are being economically produced by broaching at Pontiac Motor Division of General Motors. The operations are done on standard broaching machines with special tools and fixtures. 5 illustr.

D *Cfm Pr Unf*

Feeding components to centreless grinders—2

Anon. *Metalworking Prod* 1959 Vol 103 (41) pp 1595-1600 (Oct 9)

11 illustr, 1 table. *D* *Chcc Pr*

High frequency grinding for Rivett No 84 internal grinder

Rivett Lathe & Grinder Inc, Boston, Mass. *Mach Tool Blue Bk* 1959 (12) p 220 (Dec); *Mod Mach Shop* 1959 Vol 32 (7) pp 170, 172 (Dec)

A high frequency spindle providing speeds up to 100,000 rev/min is now offered on the standard Model 84 internal grinder. Hole sizes from less than ¼ in. diameter up to 3 in. may be ground to a micro-inch finish, it is reported. 1 illustr.

D *Chcn Pr*

Comparative grinding demonstrations of opening of Dia-Mo-Rama Room at A.I.T. draw large crowds for Chicago Chapter

Anon. *Carbide Engng* 1959 Vol 11 (11) pp 6-7 (Nov)

Describes opening of the AIT Diamond Tool Co's 'Dia-Mo-Rama' room, equipped with four grinding machines for showing various techniques. A talk on synthetic diamonds was followed by a demonstration of surface grinding with resin bond synthetic diamond wheels on a Boyar Schultz surface grinder. Other demonstrations included the off-hand grinding of carbide inserts, electrolytically, with a Hammond SCE-6 grinder, and plunge grinding on a surface grinder to show advantages of new bonding methods. 9 illustr.

D *Chc Nvh Urb*

LITERATURE REQUESTS

When applying for the loan of literature abstracted in this journal, please quote the title of the article, the name of the author, and the number of the page on which it appeared.

Grinding attachment. Schleifvorrichtungen

Anon. *Industr Anzeig* 1959 Vol 81 (99) pp 1615-1616 (Dec 11) (In German)

As the forces at work in grinding are considerably less than those in turning operations, the apparatus can be much lighter in weight. An external clamp arrangement, a set-up for edge grinding external cutter forms, and one for grinding drilled holes in conical wheels are described. 6 illustr.

A *Ceqb Pr:Chc Psc*

Technical shorts : sheet beryllium ground

Behr-Manning Co, Troy, NY. *Tool Engr* 1959 Vol 43 (6) p 137 (Dec)

Sheet beryllium has been ground and polished to a finish equivalent to No 4 stainless steel at Behr-Manning Co : this is believed to be the first production grinding. To remove pits and inclusions, it was necessary to grind 0.008 to 0.010 in. from the surface. Best results were obtained with a grit sequence of 60, 100, and 150, using X-weight cloth to which silicon carbide abrasive was waterproof-bonded with an all-resin adhesive.

D *Bbj Chc Unf/Bbj Chm Unf*

Brush honing

Anon. *Amer Mach* 1959 Vol 103 (26) p 3 (Dec 14)

Main gear shafts for German Ford cars are brush polished for 10 sec on a Greif automatic twin-brush polishing machine to produce a finish similar to that obtained by honing or lapping. Before polishing, shafts are ground on precision cylindrical grinders. Fibre bristle brushes are used, with a liquid compound sprayed on at intervals of from 0 to 20 seconds. Surface finish is improved five-fold, and sharp edges are removed from the splines and lubrication groove.

D *Chm Pv Rdc:Pr*

Automatic tool grinding machine. Automatic-Werkzeug-Schleifmaschinen

Vollmer-Werke, Biberach. *Industriekurier* 1959 Vol 12 (201) p 701 (Dec 31) (In German)

An automatic tool grinding machine produced by the Vollmer-Werke is specially suited to the grinding of milling cutters with steel and sintered carbide cutting edges. It is possible to grind milling tools for machining wood and synthetic materials of up to 400 mm diameter and with a cutting length of up to 20 millimetres.

K *Alc Bkc Chc Prs*

Semi-automatic grinding and polishing. Halbautomatisches Schleifen und Polieren

E. Hau, H. Kremer. *Maschwelt u Elektrotechnik* 1959 Vol 14 (23-24) pp 564-566 (Dec) (In German)

9 illustr. *A* *Chc Prsb/Chm Prsb*

Grinding of carbide-tipped mining tools

J. Jaeger. *Neue Huette* 1959 Vol 4 (7) pp 395-397 (July) ; *Bull Brit non-ferr Met Ass* 1960 Vol 40 (366) p 24 (Jan) (Original in German)

D *Alz Bkc Chc*

Do's and Don'ts about grinding-wheel safety

Carborundum Co, Niagara Falls, NY. *Machinery, NY* 1959 Vol 66 (2) p 143 (Oct)

D *Pe.2595*

Progress in polishing

F. H. Wells. *Metal Ind, Lond* 1959 Vol 95 (18) pp 413-415 (Dec 11)

Abstracts of two papers presented at an Institute of Metal Finishing symposium deal with chemical and and electrolytic polishing and with recent developments in the field of barrel finishing.

D *Chm.132*

It pays to be a good tool detective

R. H. Oberholtzer (Kennametal, Inc). *Carbide Engng* 1959 Vol 11 (11) pp 11-16 (Nov)

Examines and analyzes various types of carbide tool failure, and surveys the history of tool design. It is stressed that part of the grinding set-up should be in the proper honing of tools, for even after sharpening with a very fine grit diamond wheel some ragged edges which are easily flaked off may remain. Proper honing will also eliminate chipping in unusually rough cuts. 22 illustr.

D *Al Chc Nv/Al Chh*

Con-rods ground in transfer line

Soag Machine Tools Ltd, London SE 11. *Metalworking Prod* 1959 Vol 103 (42) p 1658 (Oct 16)

An Elb machine, believed to be the first fully automatic surface grinder developed for use in transfer lines, has two wheelheads for grinding two con-rods simultaneously. Each con-rod, located in the gudgeon pin bore and on the outside contour of the big-end boss, has a fixed amount of stock removal from the joint face independent of the big-end bore centre.

D *Chcm Prs*

Cylindrical and internal grinding machine. Rund- und Innenschleifmaschine

Anon. *Industr Anzeig* 1959 Vol 81 (36) p 559 (May 5) (In German)

The grinding head may be turned through 360° and fixed in a choice of four positions. The mechanical table drive can be set in six positions between 0.25 and 2.5 m/min, while the hydraulic control of the table speed is adjustable between 0.1 and 6 m/minute. Special bronze bearings, automatic grinding measuring attachments and equipment for plunge-cut grinding are other features of the machine. 1 illustr.

A *Chcl Pr/Chcn Pr*

Tool grinding machine with optical profile grinding attachment. Werkzeugschleifmaschine mit optischer Profilschleifeinrichtung

Anon. *Industr Anzeig* 1959 Vol 81 (103-104) pp 1693-1694 (Dec 29) (In German)

A tool grinding machine with an optical profile grinding system can grind milling cutters without re-setting. By underpriming the dividing head it is possible to grind cutting heads of up to 400 mm diameter, while end milling cutters of up to 500 mm total length can be sharpened. A special attachment is a coordinated profile grinding apparatus which enables die stamps, matrices, threads, *etc*, to be manufactured. 2 illustr.

K *Alc Chch Pr*

Precision, clamping, and electrical hand tools. Praezisonswerkzeuge, Spannzeuge, elektrische Handwerkzeuge

Anon. *Draht* (1959) Vol 10 (12) p 656 (Dec) (In German)

Amongst the products described are truing and turning tools and the K-plus diamond grinding wheel made by Winter & Sohn. The grinding wheel shows the latest development in a synthetic resin bond, and contains both natural and synthetic diamond. It is claimed to give 100% better results than the conventional wheel. 1 illustr.

A *Nv Urb/Nvh Urb*

Don't overlook the rubber contact rolls

C. C. Porter. *Grits & Grinds* 1959 Vol 50 (8) pp 12-15 (Aug)

Rules to follow in selection, care and use of sheet grinders and polishers. Among the most important factors is the rubber contact roll on which a coated abrasive belt runs. Such rolls can extend belt life and improve grinding and polishing life if they are well used. 3 illustr.

D *Pee Psz Rmt*

BP 820,046 **Norton Grinding Wheel Co Ltd** (Dec 17, 1956—conv date, USA)

Mounted points

'Mounted point' means a small grinding wheel mounted on the end of a shank to be clamped in the chuck of a power hand tool driven by an electric motor or an air motor. The tool portion of the (steel) shank is coated (flame sprayed *in situ*) with one or more fused crystalline abrasive metal oxides having sharp melting points, selected from the group of aluminium oxide, zirconium oxide, and titanium oxide. A silicate or glassy bond may be added. The tool portion is preferably macroscopically roughened, *eg* blasted. Tests were made with a point 0.065 in. in diameter rotated at 100,000 rev/min, equal to a surface speed of 1,700 ft/min (6,500 is normal), the safety factor being over 25 to 1. (4 claims, 3 illustr). Ref: BP 745,257 (flame spraying); USP 2,769,699 (fused zirconia); USP 2,653,107 (fused zirconia-titania).

J *Peh.545*

USP 2,889,215 (Apr 28, 1955) **E. W. Nelson, Continental Oil Co**

Grinding composition vehicle

For grinding and lapping metals two general types of carrier bases exist, *ie* water base compositions and oil base compositions. Water evaporates through the heat developed during grinding and the dispersion dries out. Oil remains on the gear after grinding and to remove it requires expensive treatment, *ie* several baths. It acts further as a lubricant, preventing the breakdown of the abrasive grains which embed themselves in the article being ground. A final step, using a finer grade of abrasive, is therefore necessary. A self-cleaning vehicle is a great advantage and can be obtained by mixing a non-viscous mineral oil as the major component with minor quantities of a fatty oil, an oil-soluble petroleum sulfonate, and a grease. (2 claims). Ref cited: 11 USP.

J *Bf Chc Qs Sj.545/Bf Chd Qs Sj.545*

FP 1,183,270 **E. F. Katzke, Crane Packing Co** (Sep 24, 1956—conv date, USA)

Method of and apparatus for lapping. Procédé et appareil de rodage

(14 claims, 5 illustr). [See USP 2,883,802, abstr *Industr Diam Abstr* 1959 Vol 16 p A245 (Dec)].

D *D*

MACHINING DEVELOPMENTS

High speed machining of honeycomb

T. A. Dickinson. *Mach Shop Mag* 1960 Vol 21 (1) pp 15-16 (Jan)

A modified electrolytic set up is enabling the Los Angeles Division of North American Aviation Inc to machine PH 15-7 Mo stainless steel honeycomb materials with unprecendented speed by means of the electrical discharge process. It is also minimizing the need for maintenance by permitting the use of a tap water instead of a corrosive electrolyte during machining operations. The set-up is on a Cincinnati skin milling machine with Anocut 3000 accessories. The machine dimensions are such that workpieces up to 36 in. × 96 in. in size can be machined.

D *Az Bfdb Ceqm*

Stainless-steel honeycomb contoured electrolytically

Ekstrom Carlson & Co, Rockford, Ill. *Machinery, Lond* 1959 Vol 95 (2456) p 1224 (Dec 9)

Stainless steel honeycomb for aircraft and missile construction is difficult to machine by conventional methods but flat surfaces are being produced electrolytically. A method whereby a modified tracer control and the electrolytic process are applied to the machining of curves, spirals and recesses in honeycomb, is said to enable almost any shape, profile or contour that can be machined on solid metal to be produced on honeycomb. Advantages claimed include maintenance of close tolerances, stress-free surfaces, and simplified skin brazing. 1 illustr.

D *Az Bfdg Ceqh*

Automatic machining line for spur gears

U. N. Pisarev, E. Kh. Reuterstein. *Traktori i Selkhozmashini* 1959 (6) pp 40-46; *Engrs' Dig* 1959 Vol 20 (12) pp 509-510 (Dec) (Original in Russian)

2 illustr. *D* *Add Ceq Prs*

25% savings on set-up, machining time with tape controlled turret lathe

J. B. Pond. *Mach Tool Blue Bk* 1959 Vol 54 (3) pp 126-128, 130-132 (Mar)

12 illustr. *D* *Ceqb Pr Wpb*

Ray gun for hire

L R Industries Inc. *Amer Mach* 1959 Vol 103 (26) p 2 (Dec 14)

L R Industries Inc is operating an electron-beam machine for job-shop work in machining and welding. The company says that holes and figures can be cut in such materials as tungsten, carboloy, and diamond, as well as steel, brass, and aluminium. Slots and holes can be as small as 40 microns across (0.0015 in.) with a tolerance of ±5 microns. The ratio of depth to width of hole is 10 : 1, but with some materials it can go as high as 20 : 1.

D *Bfp Cfbm/Bkg Cfbm/F Cfbm*

Spot news . . . A technique for hole 'drilling' and riveting in one operation

Anon. *Metalworking Prod* 1960 Vol 104 (1) p 5 (Jan 6)

A technique for hole 'drilling' and riveting in one operation has been devised in the USSR. The process uses a covered high-temperature electrode connected to a welding generator source of 1,000 amp capacity. First, with reduced power welding arc and application of light pressure to the electrode, the metals to be joined are pierced by the electrode. Then power is increased to cause the electrode to melt fast in the cavity and ring moulds form the 'rivet' heads.

D *Cfbg*

Spark-eroson : multiple head installation for machining apertures in gas-turbine blade-rings

Anon. *Aircr Prod, Lond* 1960 Vol 22 (1) pp 8-18 (Jan)

Describes a multi-head spark-eroding installation, now in use at the Leavesden factory of de Havilland Engine Co Ltd, for the machining of blade-retaining slots in Nimonic 75 material. 13 illustr.

D *Ceqm Pt*

Where is plasma arc today ?

Anon. *Amer Mach* 1959 Vol 103 (22) pp 125-127 (Oct 19)

A description of the uses of the plasma arc. As a cutting tool, the Heliarc toreh has proved its value in cutting stainless steel and non-ferrous metals. Maximum thicknesses are 3 in. for aluminium and 2 in. for stainless steel, but 90% of cutting in these materials is within these limits. 4 illustr.

D *Bf Ceqm Pt*

Cavity sinking—electrolytically !

Anon. *Carbide Engng* 1959 Vol 11 (11) pp 22-23, 25 (Nov); *Tool Engr* 1959 Vol 43 (6) pp 50-51 (Dec)

Describes Anocut Engineering's new cavity sinking machine tool which applies the firms's basic electrolytic principle to the sinking of irregular holes and shapes following the contour of an electrode made for the purpose. In this case, however, the non-rotating electrode is plunged linearly without rotation into the work material. Advantages claimed over electro-discharge machines are higher rates of removal, intense removal concentrated in small areas with high penetration rates, and no electrode wear. 7 illustr.

See also *Industr Diam Abstr* 1960 Vol 17 p A20 (Jan).

D *Cfbg Pr*

Electro-mechanical working of very hard materials

A. Ya. Artamonov. *Vestnik Mashin* 1959 Vol 39 (5) pp 61-65; *Tooling* 1960 Vol 14 (4) pp 47-49, 51 (Jan) (Original in Russian)

5 illustr. *D* *Ba Ceqm*

USP 2,891,137 **A. C. Graell**

(Mar 8, 1957—conv date, Spain)

Control circuit for electrical discharge metal machining apparatus

(9 claims, 2 illustr). Ref cited : 4 USP.

D *Bf Ceqm Pt W p.545*

FP 1,182,458 **G. K. N. Group Services Ltd**

(Aug 16, 1956—conv date, Gt Britain)

Device for spark machining. Dispositifs pour l'usinage par étincelles

The formation of an arc between tool and workpiece is detrimental to the accuracy of the work and to the finish of the machined surfaces. The tendency to arcing is reduced by producing an oscillating voltage excited by the preceding spark discharge in an oscillating circuit, which modifies the recharging voltage of the condenser so that the voltage of the current passing through tool and workpiece after its initial reduction remains below the limit at which an arc is not extinguished. This may also be achieved by reducing the voltage several times during the interval following the spark discharge. (15 claims, 3 illustr).

J *Ceqm Pr.545*

DAS 1,059,271 **G. E. Comstock, Deutsche Norton GmbH**

(Apr 28, 1953—conv date, USA)

Method and device for the electrolytic machining of workpieces. Verfahren und Einrichtung zum elektrolytischen Bearbeiten von Werkstuecken

The method is characterized by feeding the electrolyte through a tool disk to the workpiece (anode). The tool disk may be provided with a grinding annulus, in which case actual contact occurs with the workpiece; otherwise the workpiece is kept from contacting the tool disk by the pressure of the electrolye fed through passages in the disk from a central duct. The grinding annulus then assists in the removal of stock by a grinding action. The annulus is preferably made of highly porous silicon carbide so that the electrolyte can pass through the pores. (6 claims, 4 illustr). Ref cited : 2 GP ; 1 FP ; 2 BP.

J *Az Ceqh.545/Ab Chcb.545*

REQUESTS FROM AMERICA

American readers who wish to order a photostat or reprint of an article abstracted in Industrial Diamond Abstracts are advised to apply directly to the appropriate journal if this is an American publication.

PRODUCTION, GRADING & RECOVERY OF ABRASIVE PARTICLES

Fluid energy mills for fine grinding of abrasives

Sturtevant Mill Co, Dorchester, Mass. *Carbide Engng* 1959 Vol 11 (11) p 42 (Nov)

Tungsten carbide lined Micronizer fluid energy mills for the fine grinding of severely abrasive materials up to the hardness of tungsten are now available. Such abrasive materials may be reduced without attritional heat to several microns without damaging the grinding unit or contaminating the feed, it is reported. 1 illustr.

D *Ba Chc Rgd Sjg*

The development and commissioning of the heavy minerals separation plant at Umgababa — South Coast, Natal

I. F. Cairns, G. Langton. *J S Afr Inst Min Metallurg* 1959 Vol 60 (4) pp 159-173 (Nov)

The plant at Umgababa produces ilmenite rutile and zircon and is the first large-scale undertaking of its kind in South Africa. The principles of separation of the individual minerals are described. The high tension separation of zircon and rutile was investigated on a small laboratory electrostatic machine, such as is commonly used for fine diamond separation. 24 illustr, 7 tables.

D *Bcd Cce.2635/Bcz Cce.2635*

FP 1,182,758 **J. E. Morris, G. Smith, Molins Machine Co Ltd**

(Sep 13, 1956 ; Jan 2/3/4/17, 1957—conv date, Gt Britain)

Knives for cutting cigarettes and other products of a tobacco basis. Couteaux utilisés pour couper des cigarettes et autres produits à base de tabac

The knives used hitherto have been unsatisfactory since their frequent regrinding requires complicated gearing for the grinding wheel feed and the dust developed during grinding is also a problem as its elimination is essential. The problems have been solved by a knife whose cutting part consists of diamond particles embedded in the metal body of the knife. The embedding of the particles may be effected in a manner known *per se*, *ie* by forcing the diamond into the adequately heated metal under considerable pressure in a suitable mould. The particles (powder) may also be fixed by embedding them in metal by electrolytic

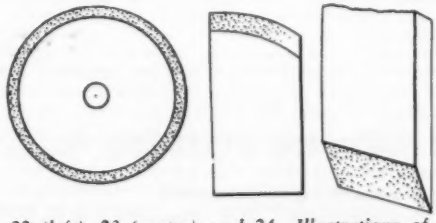


Fig 22 (left), 23 (centre), and 24. Illustrations of three possible shapes of knife : circular, scythe-shaped, and straight-edged. FP 1,182,758.

deposition. The knives may have different shapes according to their use : circular for cigarette machines as shown in Fig 22, scythe-shaped as in Fig 23, or, in particular for cutting tobacco, with a straight edge as in Fig 24. The width of the knife, depending on its diameter, lies between 0.1 and 0.5 mm, the cutting edge not exceeding 0.025 mm to be finish ground or honed to a very sharp edge. (12 claims, 14 illustr).

J *Ag Ceg Nfm.545*

TOOL PRODUCTION

This is cold point drilling !

F. A. Meline. *Carbide Engng* 1959 Vol 11 (12) pp 12-14 (Dec)

Variations in drill design have followed the advent of high temperature alloys. This article reports on features of and results achieved with the cold point drill, announced by Mossberg Inc of Cincinnati during the past year. The design utilizes a specially shaped carbide tip and the body is of 4130 aircraft tubing, which is fluted. A single hollow core permits a large volume of coolant to reach the cutting zone under pressure. Among applications described was the drilling of Haynes 701 Stellite by a Buffalo Hollow Spindle drilling machine used with Hoffman diamond impregnated core bits and cold point drills. A table gives results of test drills of various materials. 5 illustr, 1 table.

D *Bkz Cfb Nhe/Bkz Cfb Plb/Plb.256*

Tools with ' throw-away ' tips

Anon. *Machinery, Lond* 1959 Vol 95 (2457) pp 1255, 1304 (Dec 16)

Besides complete elimination of tool grinding, and consistent performance by cutting edges provided that the tips are correctly applied, throw-away tools offer several advantages. These include economy ; reduction of idle machine time by indexing and inverting clamped tips of the precision type while the holders are in position ; and the number of cutting edges available on the throw-away tips. *D* *Pdcb*

New drill for the aircraft industry

Chicago-Latrobe, Chicago, Ill. *Mach Tool Blue Bk* 1959 (12) p 212 (Dec)

A new drill, made of 8% cobalt super HSS for more holes per drill, is designed to be used in high strength aircraft and missile materials. The special split point is said to provide maximum penetration rate for production drilling of high strength alloys.

D *Pl*

Tools for shaping by chip removal. Werkzeuge der spanenden Formung

F. Puehler. *Z Ver dtsch Ing* 1959 Vol 101 (33) pp 1622-1624 (Nov 21) (In German)

The principal cutting tool materials are : HSS or HSS with electrically deposited carbide cutting edges, sintered carbide, and ceramic used chiefly in the form of inserts. The methods of machining with such tools include turning, milling, drilling, reaming, grinding, honing and lapping. 7 illustr, 28 ref.

A *Ceq Pdb/Ceq Pdc/Ceq Pdd*

Design and use of tools in automatic lines

A. Ya. Malkin, D. I. Semenchenko. *Machines & Tooling* 1959 Vol 30 (8) pp 40-43 (Original in Russian)

To manufacture components automatically, cutting tools must conform to certain specific requirements. These include a predetermined and high tool life, ensured by using carbides ; developing suitable cutting edge geometery for each operation ; and using coolant under pressure in the cutting zone. Other important requirements include quick tool change, good chip formation, and maintenance of given dimensional life. 9 illustr. *D* *Pd.21*

A new carbide. Un nouveau carbure

Anon. *Mach Mod* 1959 Vol 53 (609) p 49 (Dec) (In French)

A carbide which can be machined and treated thermally by all the methods used for steel has been put on the market, and is said to offer new possibilities for the manufacture of very resistant tools.

A *Ceqb Pdc*

Drill points modified for tough steels

J. A. Edwards. *Metalworking Prod* 1959 Vol 103 (52) p 2112 (Dec 30)

2 illustr. *D* *Pl Rw*

Method of producing cutter wheels with uneven tooth spacing

S. Herman. *Machinery, Lond* 1960 Vol 96 (2460) pp 12-14 (Jan 6)

4 illustr. *D* *Alz Ceq.1456*

Which is the least expensive method of holing carbides ?

Anon. *Carbide Engng* 1959 Vol 11 (12) p 15 (Dec)

A table gives comparative toolholder costs and shows a constant number of cutting edges required for each type of tool. 1 table. *D* *Pdc Psp*

DAS 1,059,794 (Apr 18, 1955) **M. Ferrand**

Device for making band shaped abrasive bodies. Einrichtung zum Herstellen bandfoermiger Schleifkoerper

A high quality abrasive-carrying metal band is obtained by an electrolytic process during which abrasive powder dropped onto the moving band from a container is embedded in an electrolytically deposited metal layer. Fig 25 shows tank 1 filled with an electrolytic fluid in which two rolls 3 and 4 carry a thin stainless steel band 6 moving in the direction of the arrows. From container 10 diamond abrasive powder

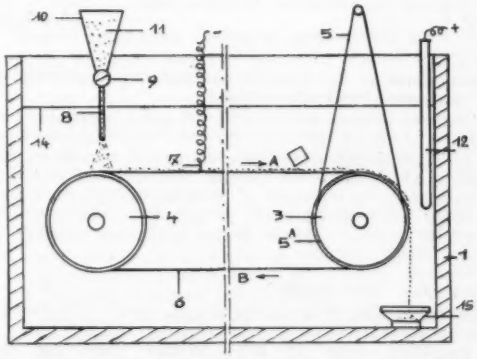


Fig 25. Diagram illustrating the process. Tank 1, filled with an electrolytic fluid, houses rolls 3 and 4 which carry the band on which diamond abrasive drops. DAS 1,059,794.

drops on the moving band, connected as cathode by sliding contact 17 to the negative pole of a source of current, while the electrolyte acts as anode. Part of the abrasive powder is then embedded in the deposited metal layer while the excess drops off into container 15. (1 claim, 2 illustr). Ref cited : 3 GP ; 1 Swiss P ; 1 BP ; 1 USP. *J* *Abz Chcb.545*

POWDER METALLURGY

Effect of crystallographic twins on the d.c. and a.c. properties of nickel-iron alloys

J. E. Thompson. *Brit J appl Phys* 1959 Vol 10 (12) pp 511-516 (Dec)

A number of alloys of nickel-iron (equal parts) have been prepared from pure materials by powder metallurgy techniques. The degree of cold rolling and the annealing temperature have been varied in an attempt to obtain the optimum magnetic properties in the material after magnetic annealing. It has been found that crystallographic twins of varying number, length and thickness are produced during the annealing process. The effect of these twins and the coercive force and alternating total loss is discussed. 9 illustr, 13 ref, 1 table. *M* *Bfxp Qc Qt*

Beryllium fabrication

Anon. *Metal Ind, Lond* 1959 Vol 95 (19) pp 430, 434 (Dec 18)

Discusses the fabrication of beryllium, including powder metallurgy, and indicates advantages and disadvantages of various techniques.
D *Bfn Ct Qt*

Bigger boron crystals produced by floating zone melting method and new ' pressed bar ' technique

Anon. *Bell Lab Rec* 1959 Vol 37 (12) p 476 (Dec)
D *Bcz Ct Qt*

Slip casting metals

P.D.S. St. Pierre (General Electric Research Lab, Schenectady, NY). *Research, Lond* 1959 Vol 12 (12) pp 460-466 (Dec)

The process of slip casting metal powder is described and compared with ceramic practice. The physico-chemical relationships between powder and vehicle are discussed and the implications of the phenomena observed are related to the technology. 7 illustr, 9 ref.
X *Bfy Ckz Qt*

Observations on the structure and sintering mechanism of cemented [sintered] carbides

J. Gurland. *Trans AIME* 1959 Vol 215 (4) pp 601-608 ; *Bull Brit non-ferr Met Ass* 1959 Vol 39 (365) p 580 (Dec)

It is concluded from dilatometric and metallographic study of sintered WC-Co and TiC-Co that sintering takes place by transport of particles through the liquid binder followed by grain growth and coalescence of carbide grains. *X* *Bkc Cql*

Fabricating ' new metals '

ICI, Metals Div, Witton. *Metal Ind, Lond* 1959 Vol 95 (19) pp 427-429 (Dec 18)

Describes work at ICI's Witton plant for the production of titanium, zirconium and beryllium and research into these and other metals, particularly hafnium, niobium and vanadium. 6 illustr.
D *Qt*

The manufacture and application of tungsten carbide in Australia. Herstellung und Verwendung von Hartmetallen in Australien

W. J. Kelsey. *J Instn Prod Engrs* 1959 Vol 32 (2) pp 91-104 ; *Werkstattstechnik* 1959 Vol 49 (12) p 768 (Dec) (Original in English, abstr in German)
A *Bkcb Qc.38/Rgd.1451.38*

Silicon nitride as a high temperature material

D. M. Rae. *NRDC Bull* 1959 (15) pp 4-10 (Oct)

A new material having excellent thermal shock and oxidation resistance and adequate creep strength at 1,200° C has been produced by the Metallurgy Division of the Admiralty Materials Laboratory as a result of a search for stator blade materials for use in gas turbines at 1,200° centigrade. The best material was found to be silicon nitride stiffened with a fine dispersion of silicon carbide. The methods of producing components in the best physical form for the projected application are described below, together with a short account of its properties, and field trials in experimental gas turbines. 5 illustr, 1 table. *X* *Raz*

Hafnium carbide and its behaviour in contrast with other carbides of the refractory transition metals

H. Nowotny, F. Benesovsky, R. Kieffer. *Planseeberichte f Pulvermetallurg* 1959 Vol 7 (2) pp 79-87 (Aug) ; *Bull Brit non-ferr Met Ass* 1960 Vol 40 (366) p 21 (Jan) (Original in German)
D *Rgz*

A review of the development of cermets

G. C. Deutsch, A. J. Meyer jun, G. M. Ault. *North Atlantic Treaty Organization AGARD Rep* 1959 (185) 20 pp (Mar-Apr) ; *Metal Powd Rep* 1959 Vol 14 (1) p 10 (Sep)
D *Blf.132*

FP 1,181,549 **Carborundum Co**
(Aug 24, 1956 ; June 19, 1957 ; July 25, 1957—conv dates, Gt Britain)

Hard ceramic materials. Matières céramiques dures

The materials consist mainly of refractory metal oxides to be used as cutting tools, *eg* lathe tools, wire drawing dies. One of the problems in producing hard ceramic materials by compacting and sintering powdered oxides is the elimination of excessive grain growth during sintering. The new material is composed of 40 to 95% (weight) reasonably pure alpha aluminium of a particle size of less than 10 μ and more than 5% up to 60% of chromium sesquioxide of a size under 10 microns. (6 claims).
J *Pdd.545*

DAS 1,058,917 **R. M. Gill, Carborundum Co Ltd**
(Aug 24, 1957—conv date, Gt Britain)

Method for producing a hard ceramic material. Verfahren zum Herstellen eines harten keramischen Materials

A mixture of 40 to 93% (weight) alpha aluminium oxide particles of a size not exceeding 10 μ (preferably below 1 μ), 20 to 59% chromium sesquioxide particles not exceeding 10 μ, and 1 to 54% of the following metals or metal mixtures : chromium, tungsten, molybdenum, ferrum, manganese, cobalt, and nickel particles not exceeding 15 μ, is heated to 1,400 to 1,700° C and subjected when heated to a pressure of at least 70 to 350 kg/sq centimetre. Lathe tools moulded from such material and ground by a diamond wheel were tested on a hard nickel-chromium-molybdenum steel. The chip production was approximately twice as high as with a tungsten carbide tool, the tool showed less wear, and the workpiece remained cooler. (2 claims). Ref cited : 1 DBP ; books 1948 and 1950. Amer Ceram Soc Bull 1952.
J *Az Bl Chc Nj.545/Rp:Qc.545*

LITERATURE REQUESTS
When applying for the loan of literature abstracted in this journal, please quote the title of the article, the name of the author, and the number of the page on which it appeared.

MISCELLANEOUS

A commemorative note on the twenty-fifth anniversary of the establishment of the Government Metallurgical Laboratory

J. Levin. *J S Afr Inst Min Metallurg* 1959 Vol 60 (4) pp 174-178 (Nov)

The project began in 1934 as the Minerals Research Laboratory. Pre-war research included work on the utilization of diamonds, and this entitles the laboratory to be regarded as a forerunner of the Diamond Research Laboratory. 25 ref.

D *Vwl.264*

Improved dry lubricants for highly polished metal surfaces

Anon. *Engrs' Dig* 1959 Vol 20 (12) pp 475-476 (Dec)

A method of subjecting graphite and molybdenum disulphide dry lubricants to a metallizing treatment is said to improve adhesion, and hence lubricating power, when dealing with highly polished bearing surfaces of such metals as titanium, and of chromium, stainless steel, *etc.* Although the metal content of the lubricant may induce slight diffusion into the bearing surfaces, the effects are said to be harmless.

D *Bf Chm Sjg*

Better testing methods help save material

C. Melzer. *German Export* 1959 (17) pp 14-15 (Sep)

3 illustr. *M* *B Cz.1456*

Some examples of set-ups on automatics at the Borletti factory

Anon. *Machinery, Lond* 1959 Vol 95 (2459) pp 1368-1375 (Dec 30)

11 illustr. *D* *Pr*

Static and dynamic behaviour of machine tool mountings

H. Opitz. *Microtecnic* 1959 Vol 13 (5) pp 229-244 (Oct) (In English)

36 illustr, 6 ref. *D* *Psw U*

The Cincinnati Milling Machine Company observes 75th anniversary with spectactular celebration

F. W. Vogel. *Mod Mach Shop* 1959 Vol 32 (7) pp 98-101 (Dec)

Describes some of the tools in operation and on display during the Cincinnati Milling Machine Co's 75th anniversary. 8 illustr.

D *Cff Pr.241.282*

Studies on the separation of boron from coke

I. A. Khan, D. Sen. *J sci industr Res (India)* 1959 Vol 18B (10) pp 434-436 (Oct)

2 tables, 16 ref. *M* *Bcz Bnub Cc*

The machine-building industry in China

Liu Ting. *Machinery, Lond* 1959 Vol 95 (2459) pp 1389-1391 (Dec 30)

2 illustr. *D* *Pr.25.372*

Diamond display

Anon. *Goldsm J* 1959 Vol 65 (490) p 559 (Dec)

Describes experiments in displaying diamonds at De Beers' London headquarters, which may revolutionize techniques used by jewellers. *D* *F.27*

How to minimize and control residual machining stresses

R. D. Halverstadt. *Amer Mach* 1959 Vol 103 (22) pp 137-144 (Oct 19)

19 illustr. *D* *Ceq Unq*

Magnetic measuring apparatus. Les appareils de mesure magnétiques

K. Stepanek. *Mach Mod* 1959 Vol 53 (609) pp 2-19 (Dec) (In French)

26 illustr. *A* *Wbz*

Hydraulic pump and motor components deburred and finished by power brushing

V. K. Charuat. *Machinery, Lond* 1959 Vol 95 (2456) pp 1220-1221 (Dec 9)

4 illustr. *D* *Az Chz*

Investigations into the effectiveness of compensating thermo-electric currents for reducing cutting-tool wear

G. Engstrand. *Trans roy Inst Technol, Stockholm, Mech Engng Ser* 1959 Vol 144 (5) 9 pp; *Engrs' Dig* 1959 Vol 20 (12) pp 507-509 (Dec) (Original in Swedish)

The author concludes that the method of reducing tool life by compensation of thermo-electric currents is of no practical importance, anyway at the present stage of development. 5 illustr. *D* *Pd Unr*

Proton microscope

French National Research Centre. *New Scientist* 1959 Vol 6 (160) p 1203 (Dec 10)

The French National Research Laboratory have released details of the first proton microscope. Performance is compared with that of the electron microscope. 1 illustr.

D *Wcmm*Wcmz*

Appraisal of Soviet mechanization and automation

J. A. Gwyer (Library of Congress, Washington). *Machinery, NY* 1959 Vol 66 (2) pp 144-148 (Oct)

D *.133.33*

Optical microscopy : a key to metallurgical progress

E. E. Thomas. *Bell Lab Rec* 1959 Vol 37 (12) pp 457-463 (Dec)

The optical microscope is important to the metallurgist in three main ways: in the development of new materials; in showing changes in the structure of metals in time; and in furthering research with the fundamental understanding of the nature of metals and alloys. 4 illustr. *D* *Vwl Wcm*

Precious stones and copper alloys

Anon. *Pro-Metal* 1959 (70) pp 182-186 (Aug); *Bull Brit non-ferr Met Ass* 1959 Vol 39 (365) p 559 (Dec) (Original in French & German, abstr in English)

Describes development of mountings for jewels used in industry, particularly in clocks and watches.

D *Tc*

Machine wear : causes and remedies. L'usura delle macchine : cause e rimedi

E. Groutel. *Macchine* 1959 Vol 14 (12) pp 1185-1188 (Dec) (In Italian)

M *Pr Unr*

Ceramics as material for gauges. La ceramica come materiale per calibri

Anon. *Macchine* 1959 Vol 14 (12) pp 1189-1190 (Dec) (In Italian)

4 illustr, 1 table. *M* *Rnb Wb*

Optical instrument for universal measuring of angles. Optische Universal-Winkelmessuhr

Anon. *Industr Anzeig* 1959 Vol 81 (99) pp 1616-1617 (Dec 11) (In German)

2 illustr. *A* *Wbh*

Historical diamonds : 'The Pigot'

Anon. *'Mindrill' Bits & Pieces* 1959 Vol 12 (6) p 3 (Oct)

D *F.28*

Production engineering developments in the Soviet Union

D. F. Galloway (PERA). *Machinery, Lond* 1960 Vol 96 (2460) pp 41-50 (Jan 6)

General article on industrial activities and research. Czechoslovakian and Polish research and Russian technical information services are also covered. 7 illustr, 4 tables. *D* *Vwke.132.33*

PUBLICATIONS RECEIVED

BOOK REVIEW

Geology of South Africa

A. L. du Toit, edited and prepared by S. H. Haughton Oliver & Boyd, Tweeddale Court, Edinburgh ; 39A Welbeck St, London W 1. 1956, 3rd ed, 611 pp, illustr, indices, maps. Price £3 3s 0d

Although this third edition was almost completely prepared by the late Alex du Toit before his death in 1948, it has been completed by S. H. Haughton and brought up-to-date by means of footnotes which indicate new facts and theories. The book contains an introductory section on general geological principles, in which various terms are defined and illustrated by their occurrence in South African geology. This is followed by an outline of the physical geography and geology ; and then the greater part of the book is devoted to the different systems and areas, each in full detail. Illustrations are numerous and clear, chapters are divided by heavy type sub-headings and are headed by a list of the subjects contained in them, and there is a full index which makes the work useful for reference. In the final chapter, which is devoted to economic geology, the principal mineral deposits are arranged alphabetically, a detailed paragraph being written about the occurrence of each one. Although thorough enough to be of use to the serious student, the style is not so technical as to make it unplatable to the amateur. *A* *Vwc.361.52*

TRADE LITERATURE

Vari-Mu diamond wheels

Triefus Industries Ltd, Manor Royal, Crawley, Sussex. 4 pp, 6½ × 9 in., illustr

Vari-Mu is a new non-metallic bond for diamond wheels designed to supersede the existing Triefus range of resinoid and vitreous bonded wheels, and said to surpass performance of these by up to 100%. The new grades complement the Mosaic K series of metallic and transitional bonds, thus making available a comprehensive range of diamond wheels. Correct selection of wheels permits grinding of any grade of carbide under any condition, according to the makers. Details are given of Vari-Mu's characteristics, particularly fast cutting, cool cutting when operating dry, and durability. Types include flared and plain cup wheels, periphery, dish, and taper cup wheels, internal grinders and hand laps. The bond takes advantage of the characteristics of new diamond grits and wheels can be supplied with any diamond grit size. *D* *Nv.57*

Mindrill conpipe drill, Bulletin No 122

Mindrill Ltd, 86-106 Plenty Rd, Preston N 18, Victoria, Australia. 4 pp, 8¼ × 10¾ in., illustr

The Mindrill Conpipe drill was developed to meet the difficulties in cutting either angle or straight holes in the side wall of concrete, earthenware, steel or cast-iron pipes. Instead of the longer process of making a hole by marking off its profile and then drilling a series of small holes round it until the centre can be knocked out, this method drills the hole in one sweep and in one to two minutes, depending on the pipe's thickness. The flow resistance problem is said to be solved by the thin wall diamond core bit which cuts a clean, smooth and accurate hole to the exact dimensions required or to match exactly the inside diameter of the pipe being joined to the drilled pipe. The leaflet gives details of capacity, feed mechanism and other features of the drill. *D* *Nhe.57*

PATENT LISTS

BRITISH

The Official Journal (Patents) 1959 (3694) (Dec 2)

826,938 UNITED KINGDOM ATOMIC ENERGY AUTHORITY. Production of grinding surfaces.

826,904 SVENSKA KULLAGERFABRIKEN AB. Automatic grinding machines.

The Official Journal (Patents) 1959 (3695) (Dec 9)

827,267 ATELIERS DES CHARMILLES SA. Electrodes and devices for securing them in an electro-erosion machine.

The Official Journal (Patents) 1959 (3696) (Dec 16)

827,716 CINCINNATI MILLING MACHINE CO. Surface grinding machine.

827,815 NORTON CO. Moulding abrasive sheet material.

828,048 CINCINNATI MILLING MACHINE CO. Method and apparatus for grinding the end of a drill.

The Official Journal (Patents) 1959 (3697) (Dec 23)

828,211 CARBORUNDUM CO. Method of making dense silicon carbide articles.

828,561 FIRTH STERLING INC. Spark machining apparatus.

UNITED STATES

Official Gazette 1959 Vol 748 (1-4) (Nov)

2,910,808 E. WILDHABER. Method and apparatus for grinding gears.

2,910,810 E. FUCHS, WAGNER & ENGLERT GmbH. Grinding wheel.

2,911,192 F. G. BOUCHER, JERSEY PRODUCTION RESEARCH CO. Vibratory rotary drilling method and apparatus.

2,911,196 H. M. CAMERON, B. K. HAFFNER, AMERICAN COLDSET CORP. Diamond drill bit.

2,911,707 B. S. O. ALMEN, SANDVIKENS JERNVERKS AB. Tool holder.

2,911,764 L. B. STEGGEMAN. Grinding machine.

2,911,765 A. A. STUDLER, C. B. STUDLER. Refacing machine.

2,911,770 O. W. DAWSON, M. W. SALES, H. W. MONO, G. H. MONO, W. G. MONO, R. J. WALLS. Fixture for positioning tool relative to grinding head.

2,911,772 H. GRONMEIER, E. HOOGLAND ZUSCHNEIDEMASCHINENFABRIK. Grinding device for cloth cutting machines and the like.

2,911,773 A. R. GOBAT, INTERNATIONAL TELEPHONE & TELEGRAPH CORP. Method of cutting semi-conductive material.

2,911,951 B. A. SWANSON. Methods of increasing the work efficiency of a tool by generating of a sympathetic vibration condition in the mass being worked, and high speed engines for employing said method.

2,912,105 R. B. ALLURED, J. L. WALKER, GENERAL MOTORS CORP. Hardness testing and sorting.

2,912,799 SA BOETTCHER, ABRADING SYSTEMS CO. Lapping machine.

2,912,802 SA BOETTCHER, ABRADING SYSTEMS CO. Lapping machine.

2,912,803 L. G. SIMJIAN. Abrading device.

2,912,804 L. G. SIMJIAN. Method of polishing articles.

2,912,968 A. STIHL. Power saw chain for use on hard rock.

2,912,971 H. C. MILLER, SUPER-CUT INC. Diamond dressing tool assembly.

2,913,236 W. J. KEHALY. Tunneling machine having a rotary cutting ring.

2,913,857 R. W. REED, W. J. RANKIN, B. F. TUNSETH, MINNESOTA MINING & MFG CO. Rotative abrasive structure.

2,914,057 J. V. ABADJIEFF, LELAND-GIFFORD CO. Truing tools for a grinding wheel.

2,914,058 K. SOMMER, SOMMER & MACA GLASS MACHINERY CO. Dressing devices.

2,914,305 F. W. WINK, BUCYRUS-ERIE CO. Lightweight portable diamond drill.

AUSTRALIAN

Official Journal 1959 Vol 29 (38-41) (Oct-Nov)

224,198 G. K. N. GROUP SERVICES LTD. Spark machining.

224,359 J. W. McBEAN. Diamond drill core container.

SWISS

Patentliste 1959 (20) (Oct)

341,801 H. FRANK, E. WILKENDORF, H. KOPPERS GmbH. Method of producing silicon carbide.

341,924 H. E. DE BRUYN, NV PHILIPS' GLOEILAMPENFABRIEKEN. Device for machining a workpiece by means of an electrode connected to an electric tension.

341,925 N. MIRONOFF, J. PFAU, ATELIERS DES CHARMILLES SA. Electric circuit of a machine for electrical machining.

341,926 J. PFAU, ATELIERS DES CHARMILLES SA. Tool for electrolytic machining and method of manufacturing this tool.

341,998 G. W. LUCAS, C. WIEDEMAN, GENERAL ELECTRIC CO. Hard metal alloy.

342,061 E. LORETAN, PARECHOC SA. Shock absorbing bearing for small mechanical movements, in particular for a measuring apparatus. (Add 339,792).

342,112 A. REDFARN. Abrasive article and method of manufacturing this article.

342,113 J. PFAU, ATELIERS DES CHARMILLES SA. Grinding wheel.

FRENCH

Bulletin Officiel 1959 Vol 76 (3938-3941) (Oct-Nov)

1,209,241 SA DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE SAINT-GOBAIN, CHAUNY & CIREY. Polishing of glass.

1,209,382 W. S. SCHILDHAUER, M. SKUZA, CARBORUNDUM CO. Method of making a body of silicon carbide.

1,210,273 F. FENOCCHIO. Diamond tool for truing abrasive wheels.

1,210,305 C. AZEMA. Tool holder device for spark machining.

1,210,338 SOC D'OPTIQUE ET DE MECANIQUE DE HAUTE PRECISION. Machine for polishing spherical lenses.

1,210,500 WICKMAN LTD. Cutting tool.

1,210,623 ETS FORTIN & SAUNIER. Rotary abrasive tools.

1,210,851 CATERPILLAR TRACTOR CO. Method and apparatus for finishing a surface.

1,211,005 PITTSBURGH PLATE GLASS CO. Glass blanks for spectacles or lenses and their method of manufacture.

1,211,389 J. E. CAMPBELL, L. A. HANSEN, C. E. LANYON, N. E. OGLESBY, NORTON CO. Paper sheets, in particular as support for applied abrasive.

1,211,447 LIGNES TELEGRAPHIQUES ET TELEPHONIQUES. Tool device for cutting thin plates.

1,211,961 A. TATAR. Machine for grinding the ends of drills.

1,212,239 M. J. - M. GHIDONE. Apparatus for determining the wear of sapphire points.

GERMAN

Patentblatt 1959 Vol 79 (47-50) (Nov-Dec)

Applications Open to Public Inspection

1,070,059 W. OSENBERG. Device for guiding a workpiece and for the frontal protection of a face grinding wheel.

1,070,520 E. W. DAWSON, CANADIAN PATENTS AND DEVELOPMENT LTD. Device for the individual polishing of small elongated workpieces *eg* turbine blades.

1,070,521 R. OBERACKER, MOVOMATIC SA. Feeding device influenced by a measuring control apparatus for a grinding machine automatically switched off on reaching the desired workpiece dimension.

1,070,849 H. SCHNADT, A. J. AMSLER & CO. Device for a pendulum impact tester for centring specimens according to Schnadt.

1,070,898 H. LINDEMANN, TH. CALOW & CO. MASCHINENFABRIK UND EISENGIESSEREI. Cutting body, preferably of hard metal.

1,070,957 C. KRUG, DISKUS WERKE FRANKFURT/MAIN AG. Grinding body, in particular face grinding wheel.

1,071,018 B. L. E. ROSANDER, SANDVIKENS JERNVERKS AB. Hollow percussion drill with liquid flushing arrangement.

1,071,251 R. SATTLER, H. SCHIERHOLT, H. J. SCHULZ, DEUTSCHE EDELSTAHLWERKE AG, ALLGEM ELEKTRIZITAETS-GES. Method and device for flushing with dielectric fluid within the spark gap in spark erosion machines.

1,071,529 W. OSENBERG. Peripheral grinding wheel.

Patents Granted

973,182 C. BALLHAUSEN, DEUTSCHE EDELSTAHLWERKE AG. The use of a powder mixture according to patent 972,437 as a means for applying hard metal to saw blades for cutting rock and method for making such saw blades.

AUSTRIAN

Patentblatt 1959 Vol 56 (10-12) (Oct-Dec)

206,323 CONTINA BUREAUX- UND RECHENMASCHINENFABRIK AG. Grinding or polishing disk.

206,343 S. ANDREAS. Endless stone chain saw for motor chain saws.

206,779 WIENER WERKZEUG- UND WERKZEUGMASCHINENFABRIK ING FRANK & CO. Precision tool grinding machine.

206,780 C. KLINGSPOR. Rotary grinding roller of great working width to be used like a grinding wheel.

207,011 CARL ZEISS. Method and device for working materials by means of a beam of charged particles.

207,285 ELEKTRO-THERMIT GmbH. Grinding machine for grinding rails true to profile.

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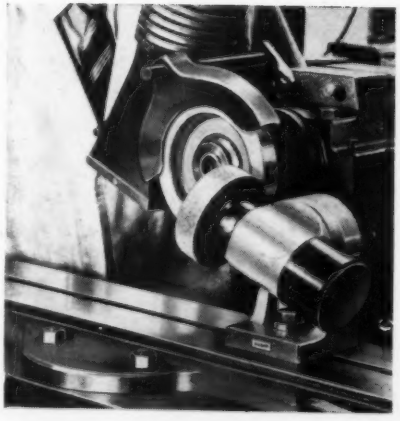

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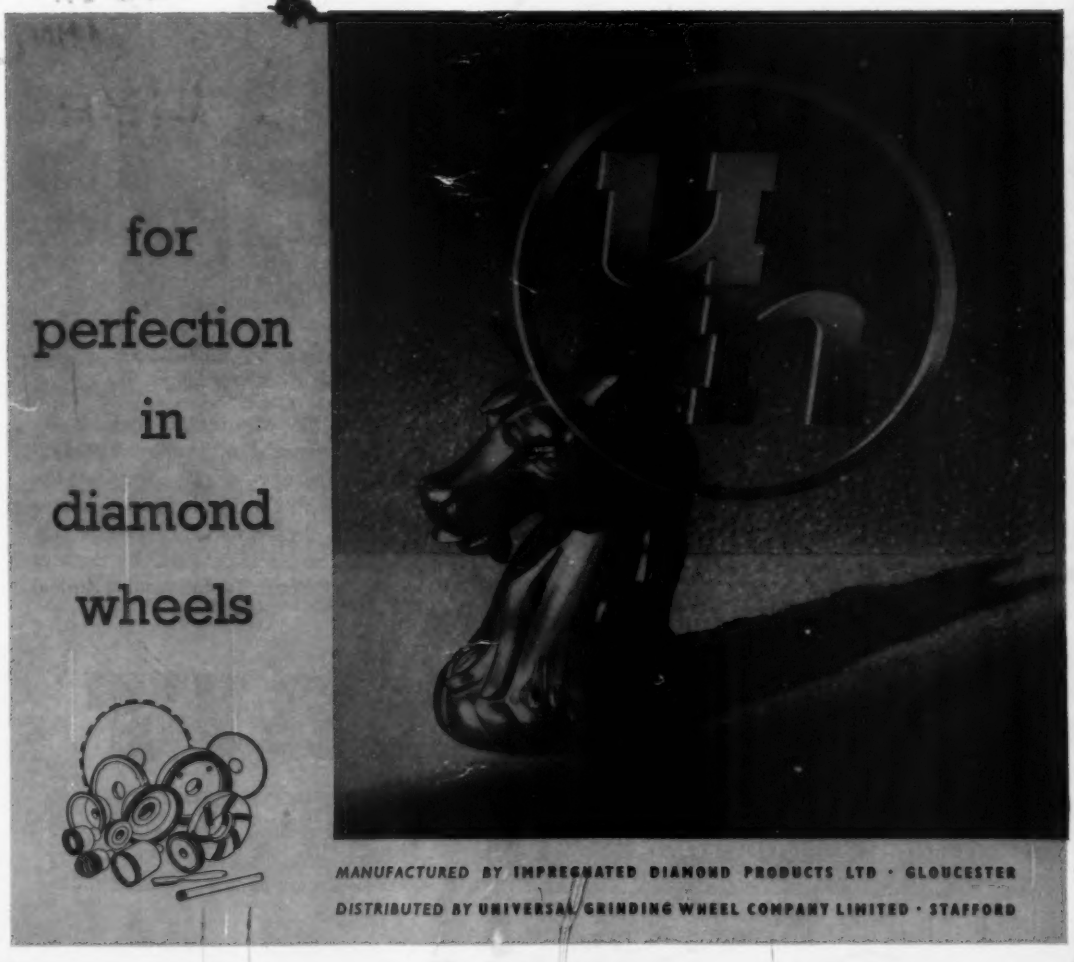
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